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## ENGINEERING PROJECT AUTHORIZATION

PROJECT NO: CS-P-15

PROJECT LEADER(S): Ying Xiang

TITLE: 7 7/8 IADC 5-1-7 CUTTING STRUCTURE OPTIMIZATION (51X KILLER)

CODE: P

### OBJECTIVES

Utilize the IDEAS program and IDEAS lab facilities to design, analyze and optimize a new 7 7/8 TCI cutting structure(s) targeted to increase the rate of penetration, footage, and durability compared to the currently available IADC 5-1-7 type products (especially the Reed HP51X). Iteratively field test these new designs with the ultimate goal of establishing a 15% to 20% performance differential with our competitor's products and additionally providing functional feedback for continuing IDEAS systems development.

### CUSTOMER NEEDS ADDRESSED:

- 1) Performance
- 2) Reliability

### TRANSLATION:

- 1) Increased ROP
- 2) Improved life and footage
- 3) Consistent dull condition

### MEASUREMENTS:

- 1) Performance Reports
- 2) Analytical/Statistical Reports
- 3) Lab Tests

### BENEFITS/PAIN:

Project benefits are to: 1) establish a performance advantage over our competitors in the 7 7/8 IADC 5-1-7 product range, 2) increase marketshare/revenues in the domestic TCI market, 3) further promote the utilization of the IDEAS program and lab to improve product performance, and 4) enhance our customer's perception of Smith as a leader in technological development. Potential pain is continued lost marketshare/revenues to Reed and other competitors who dominate the market for 7 7/8 5-1-7 type products.

### DESIGN INPUT ACCEPTANCE:

Ying Xiang  
Project Team Leader

11/13/98

Date

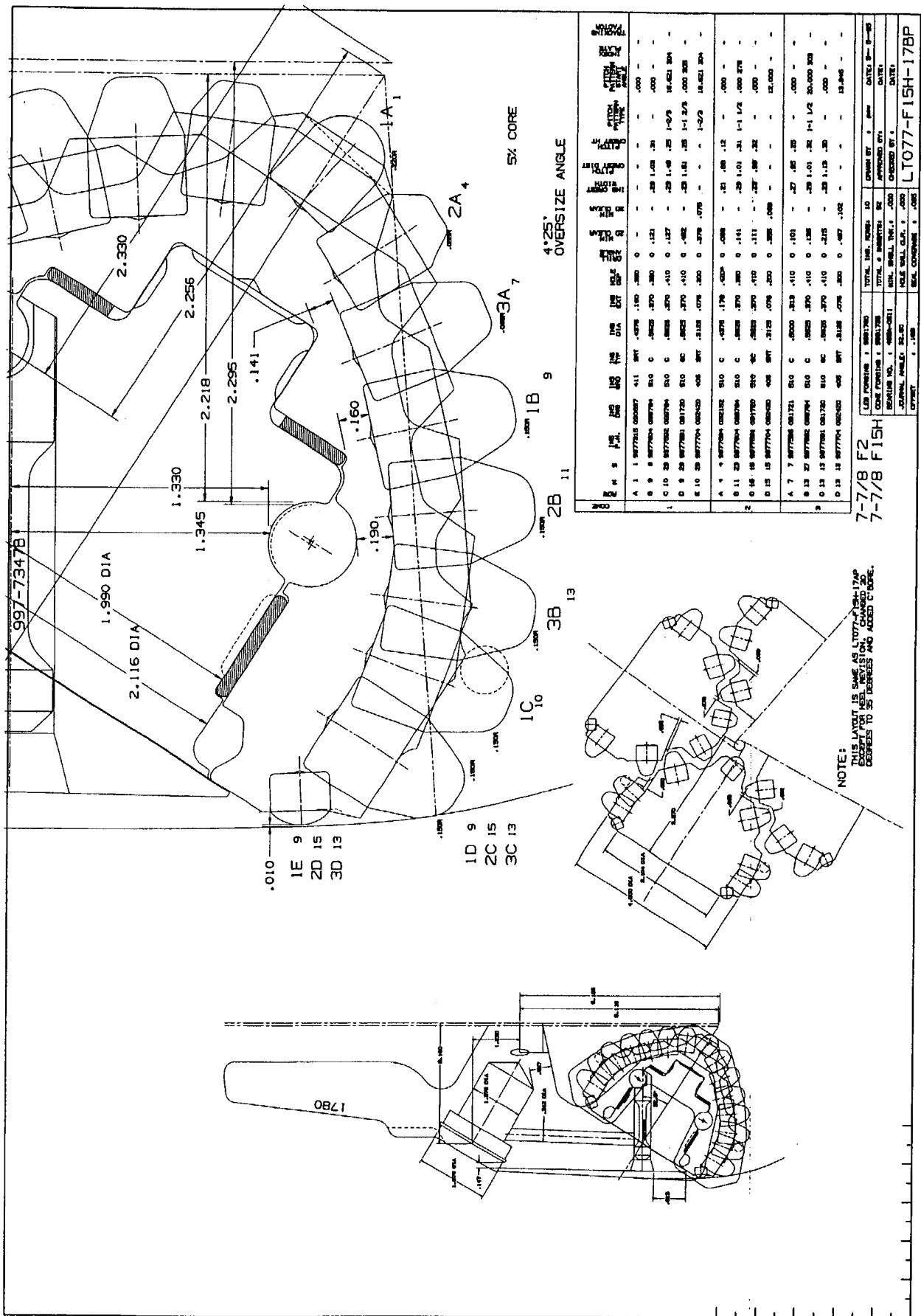
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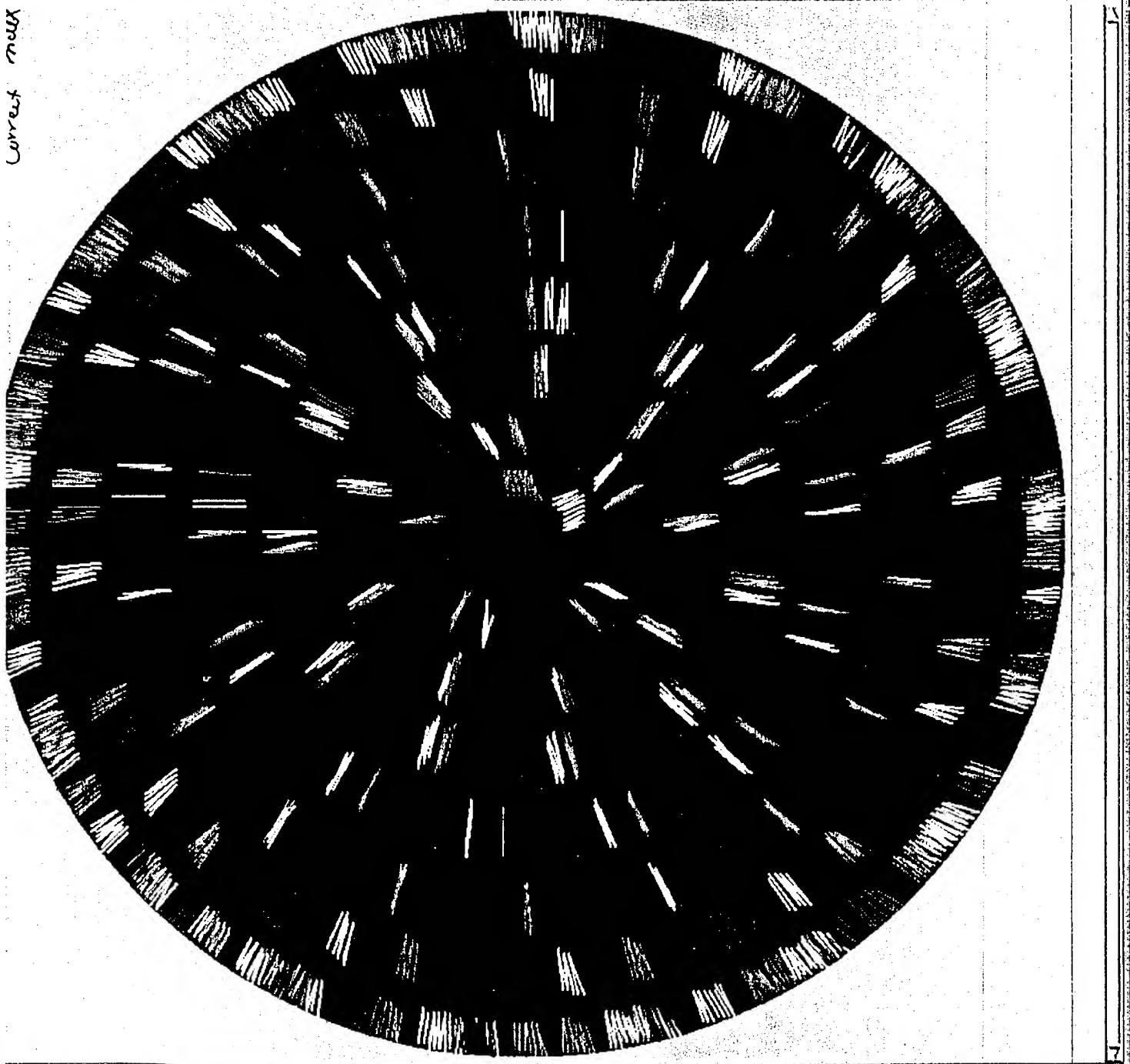
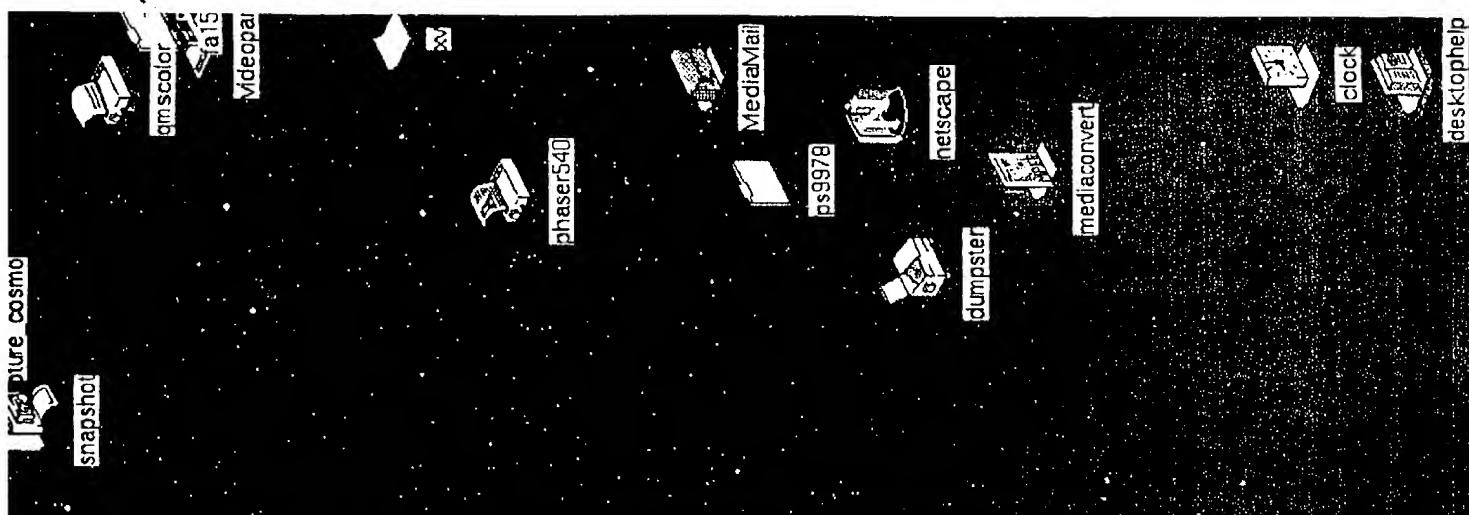
E. C. Smith  
V.P. Engineering Smith Tool

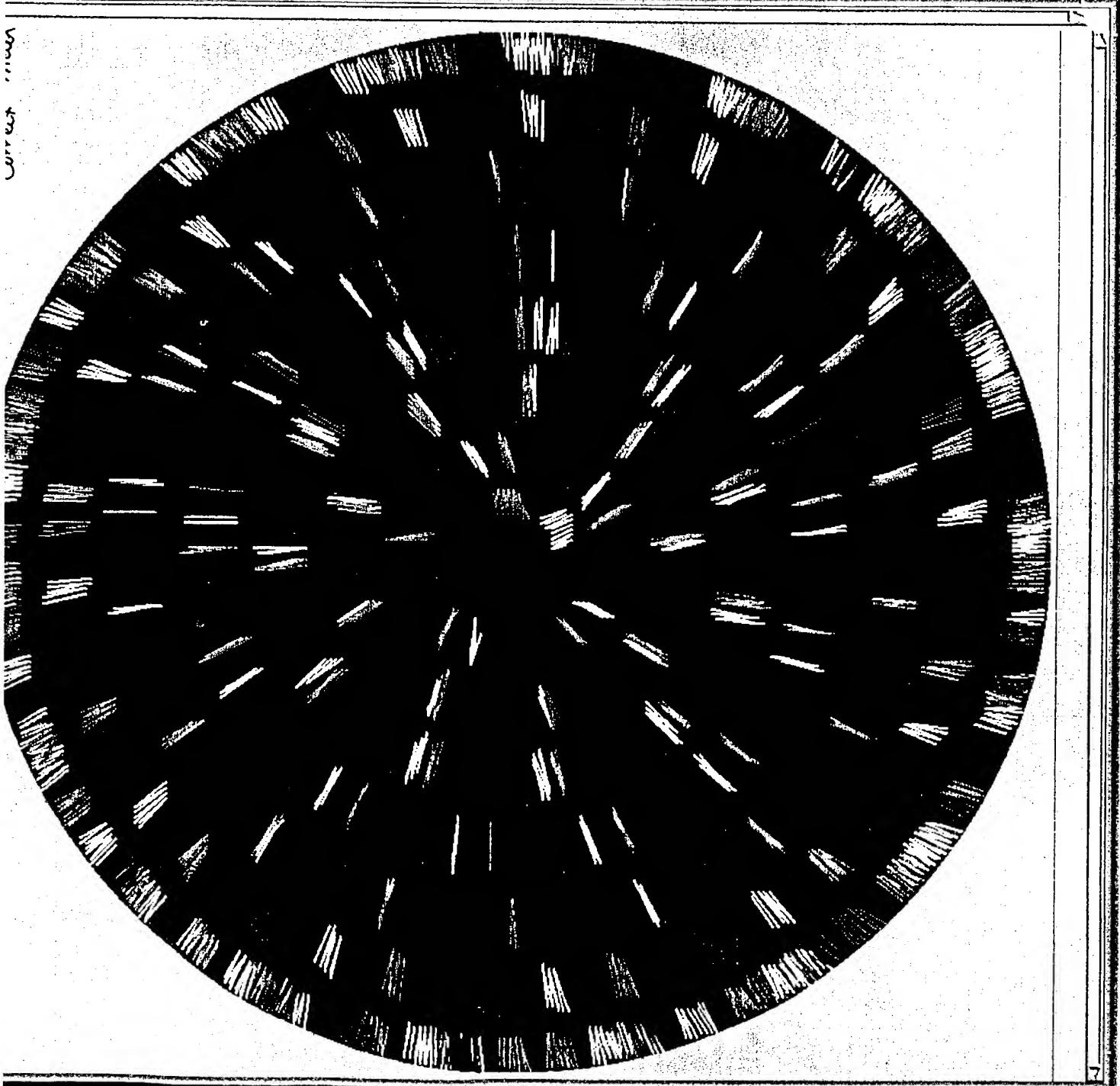
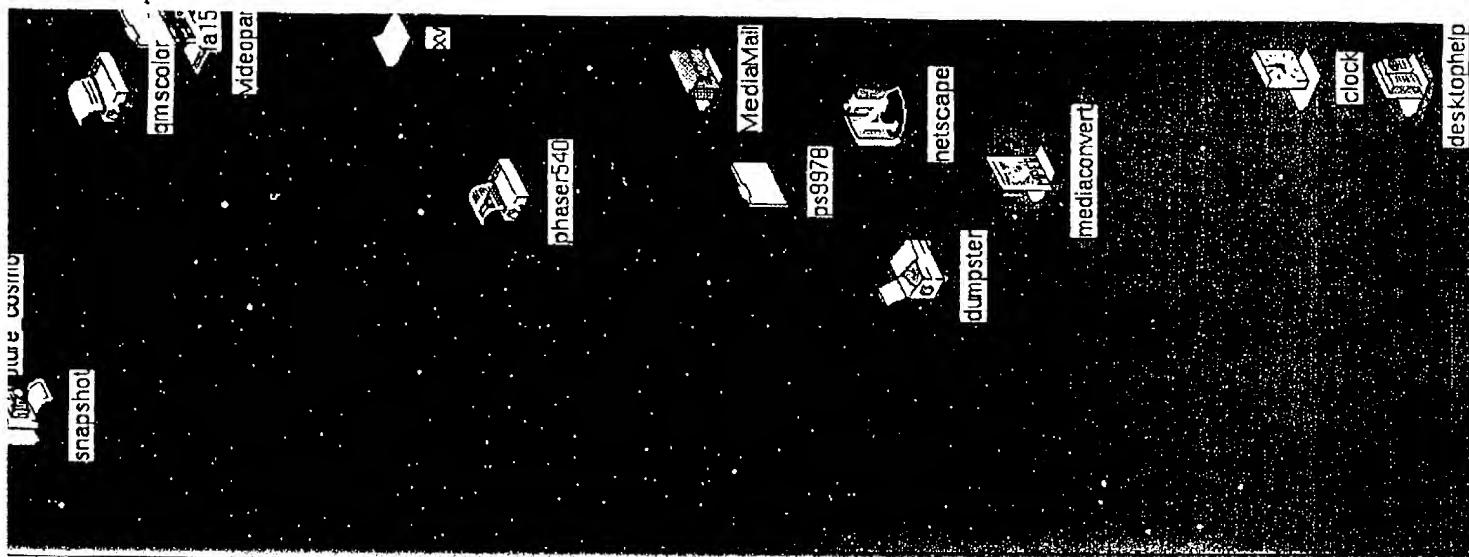
11/17/98

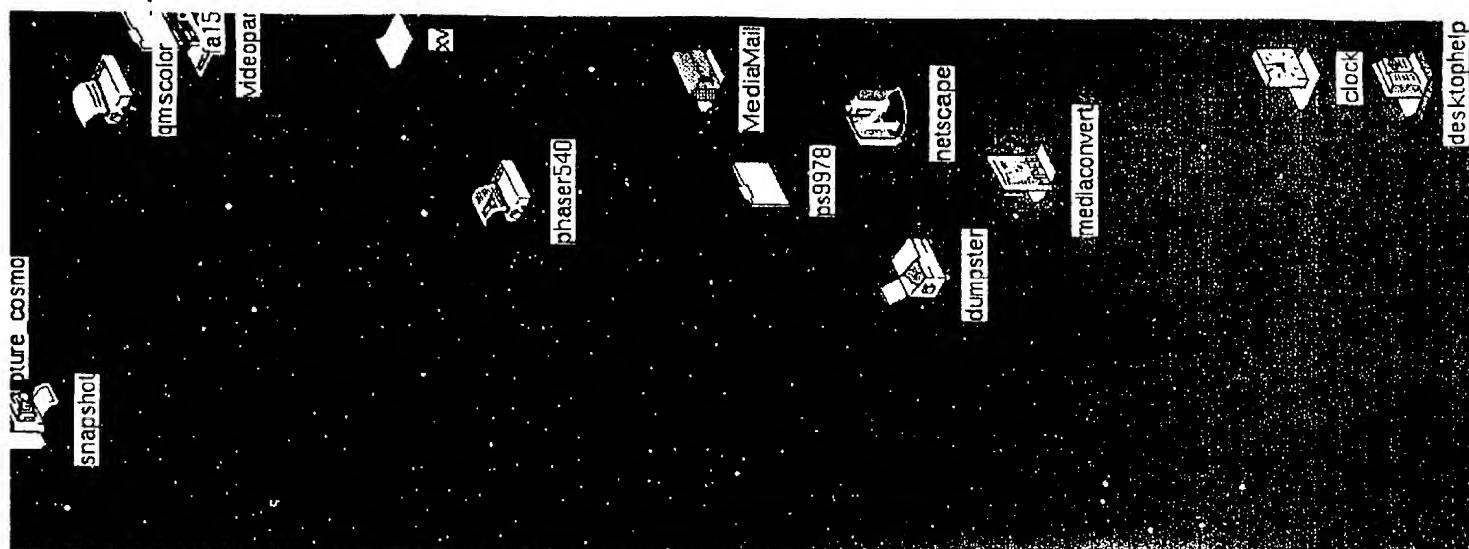
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FISH ER 5754



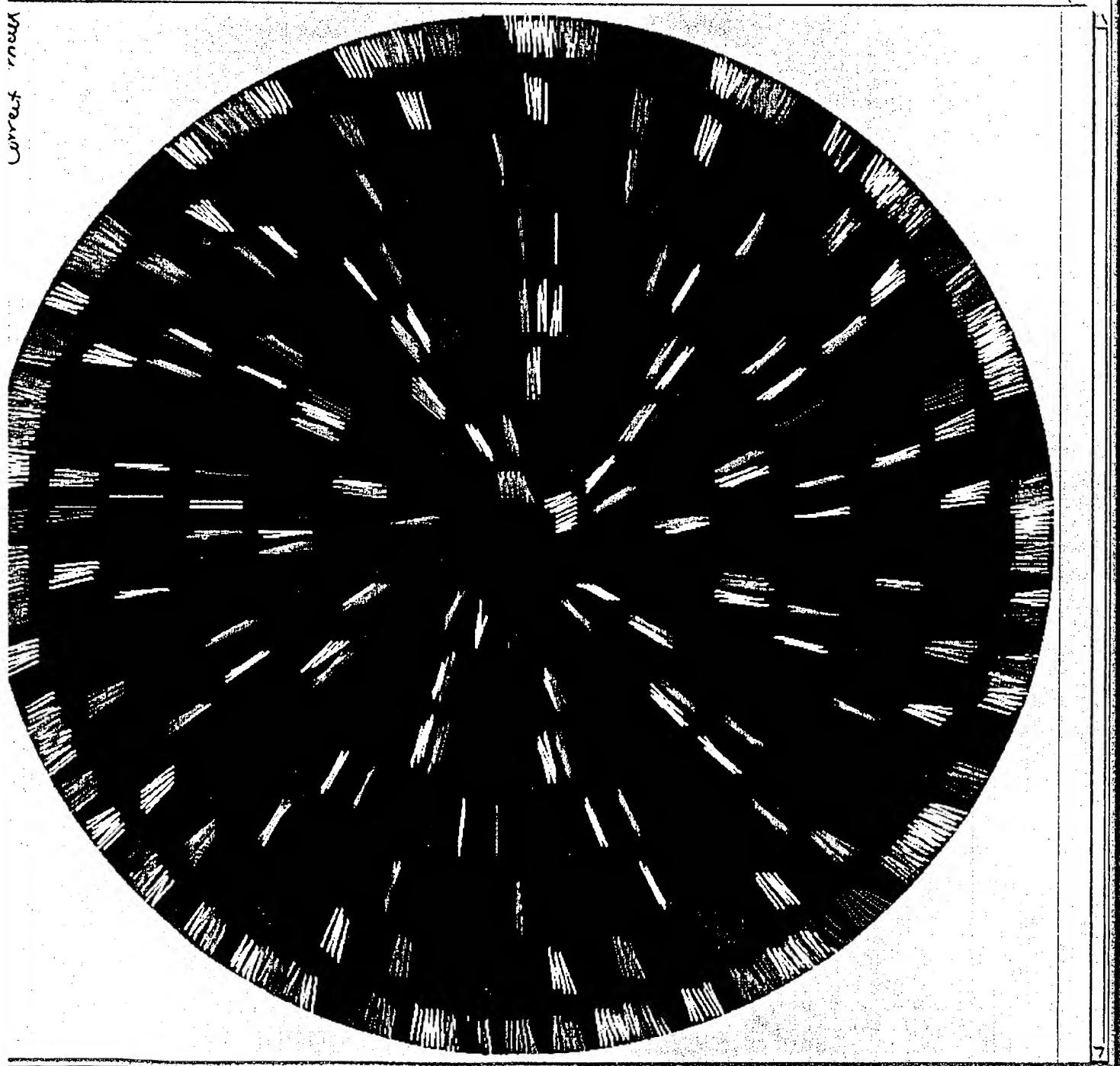


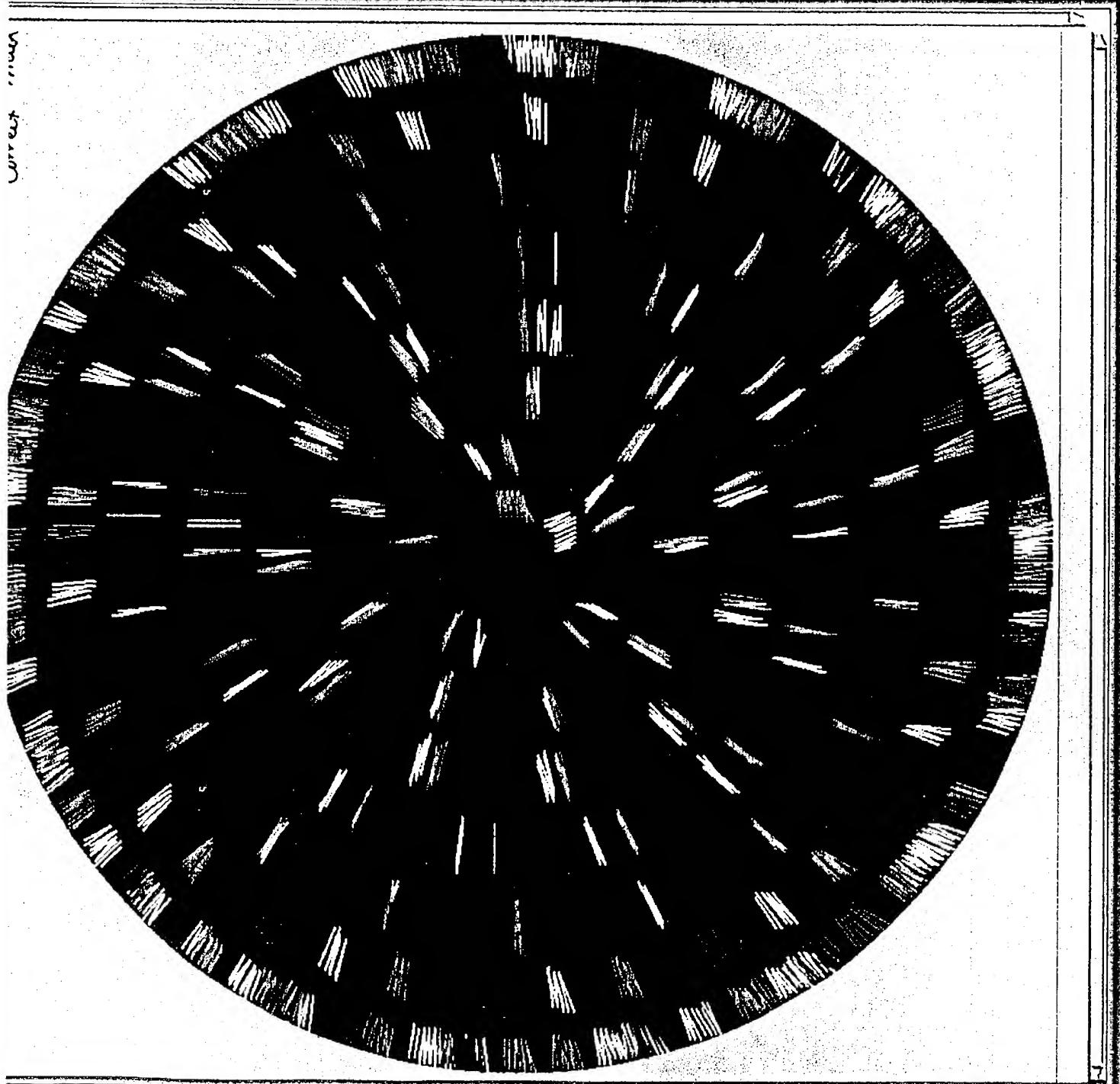
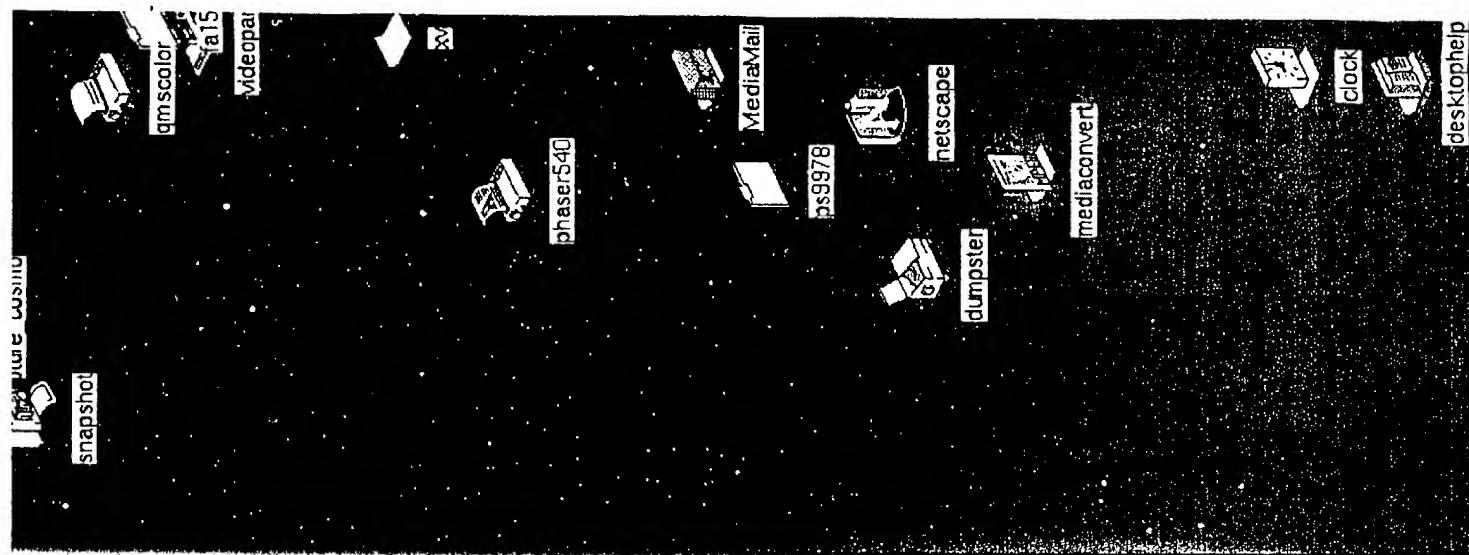


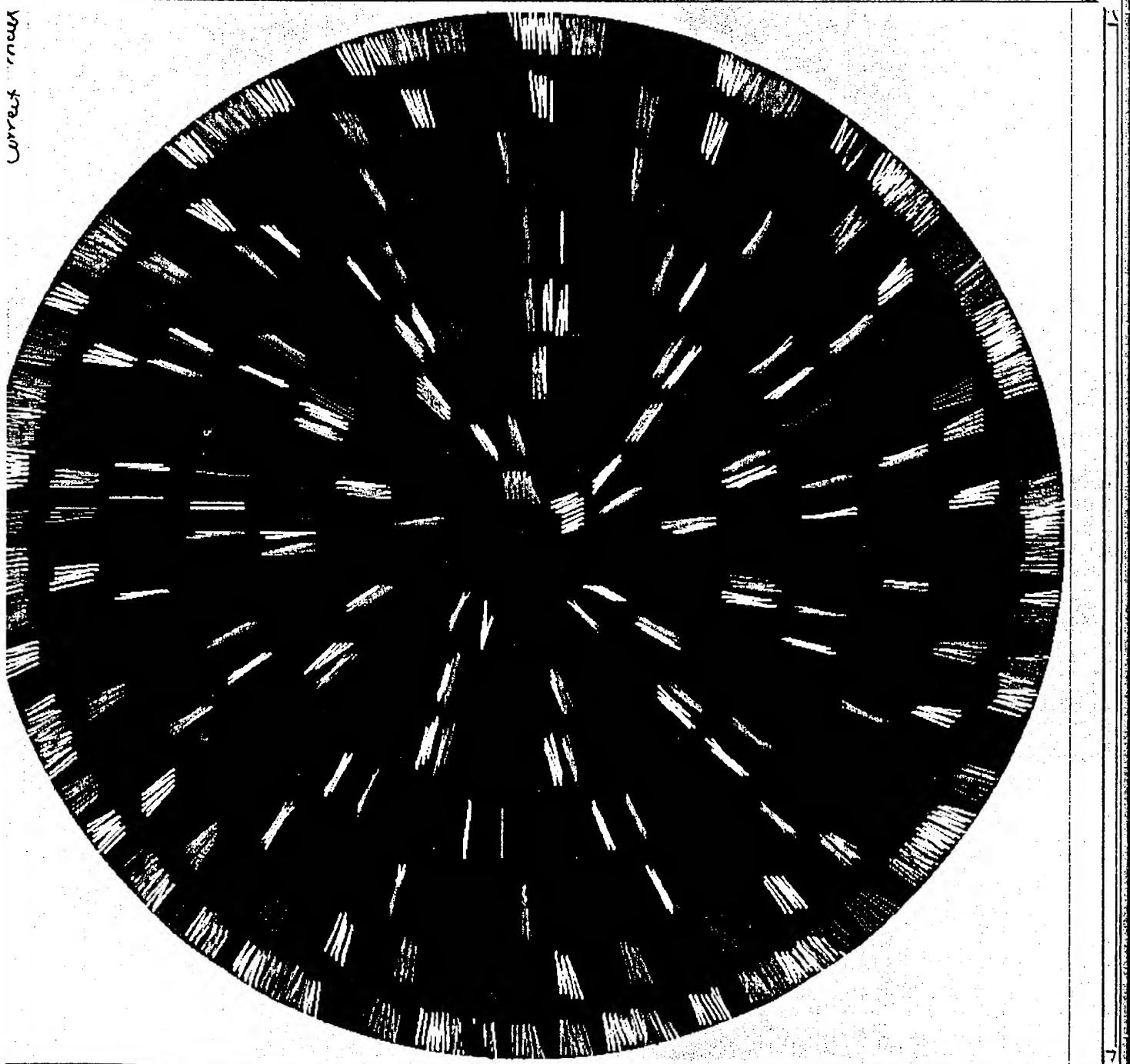
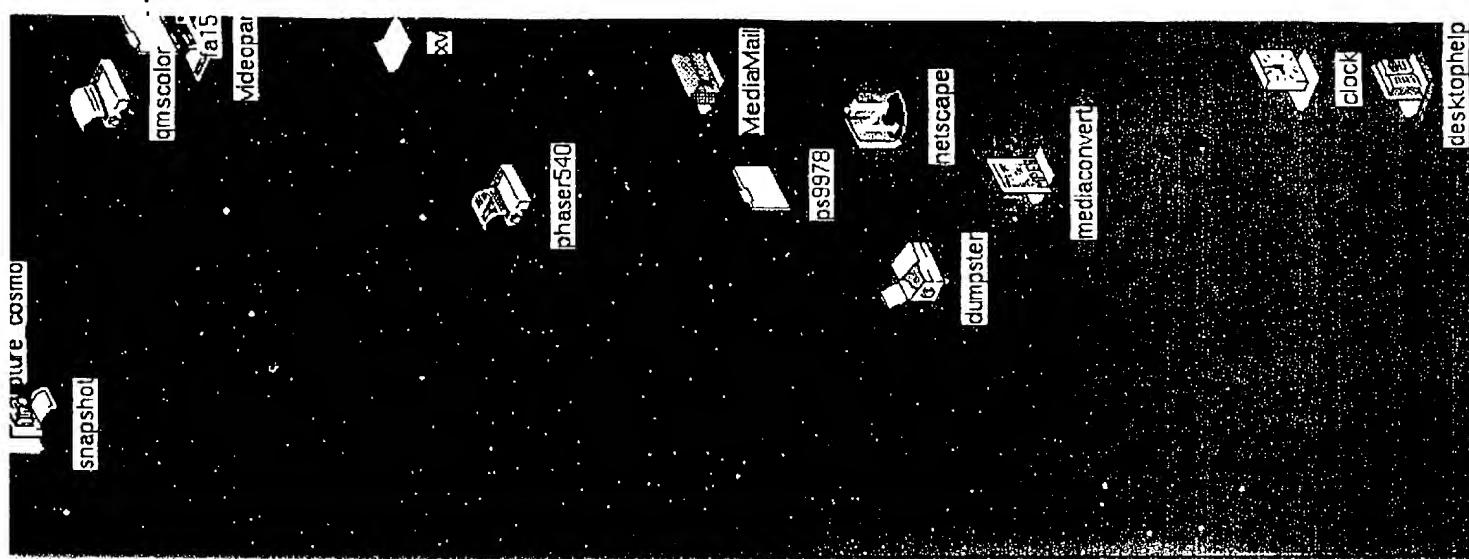


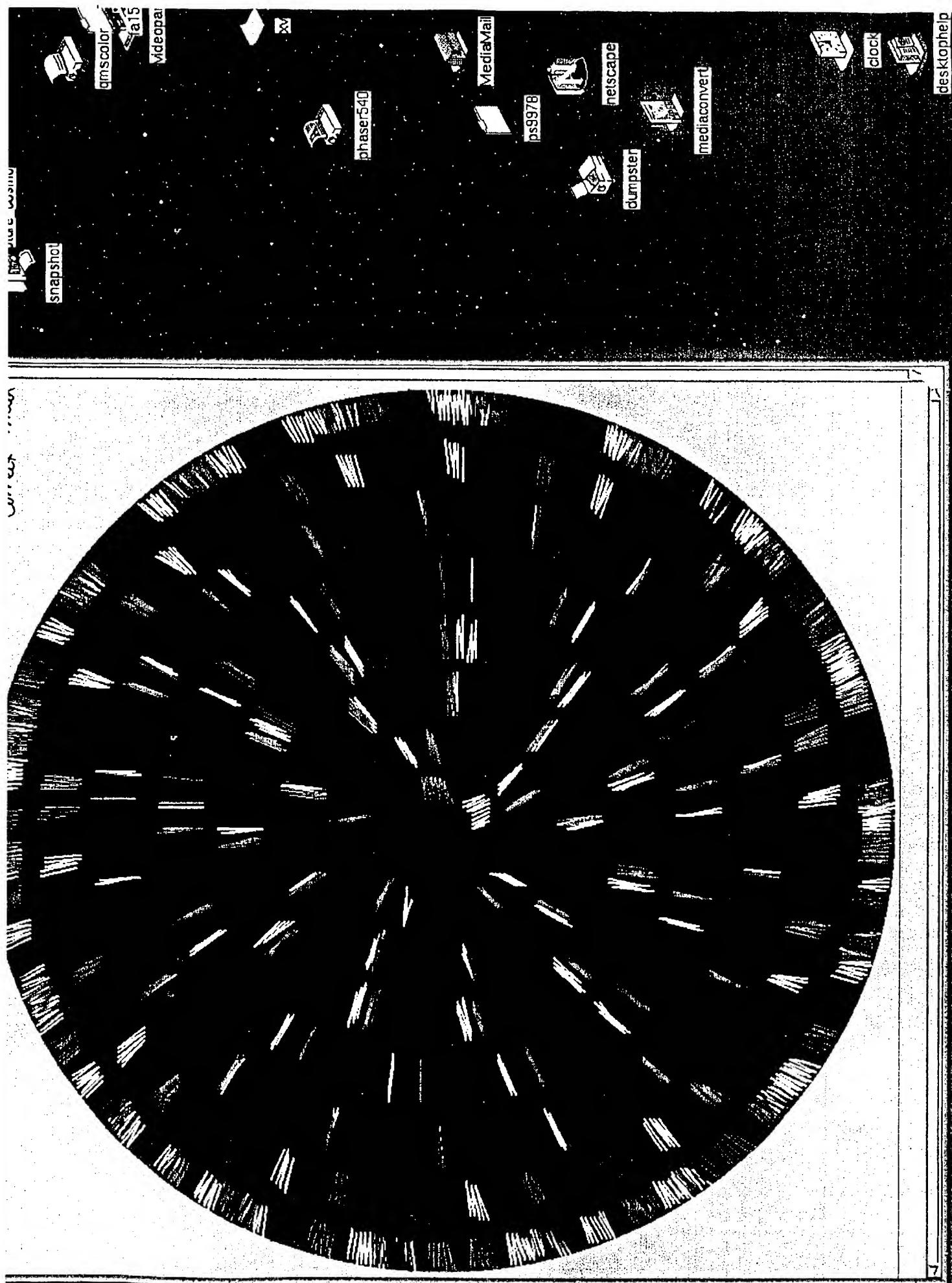
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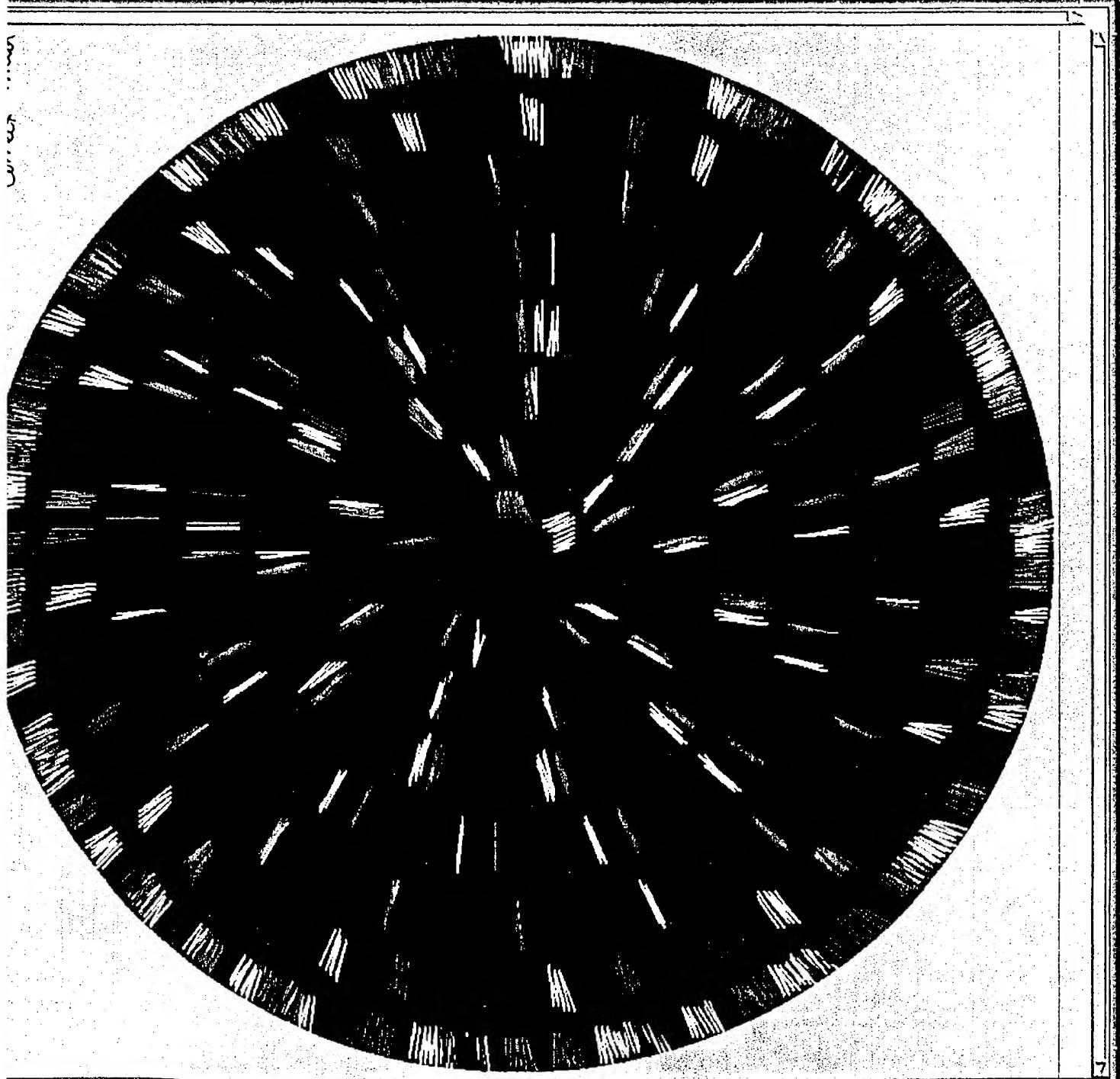
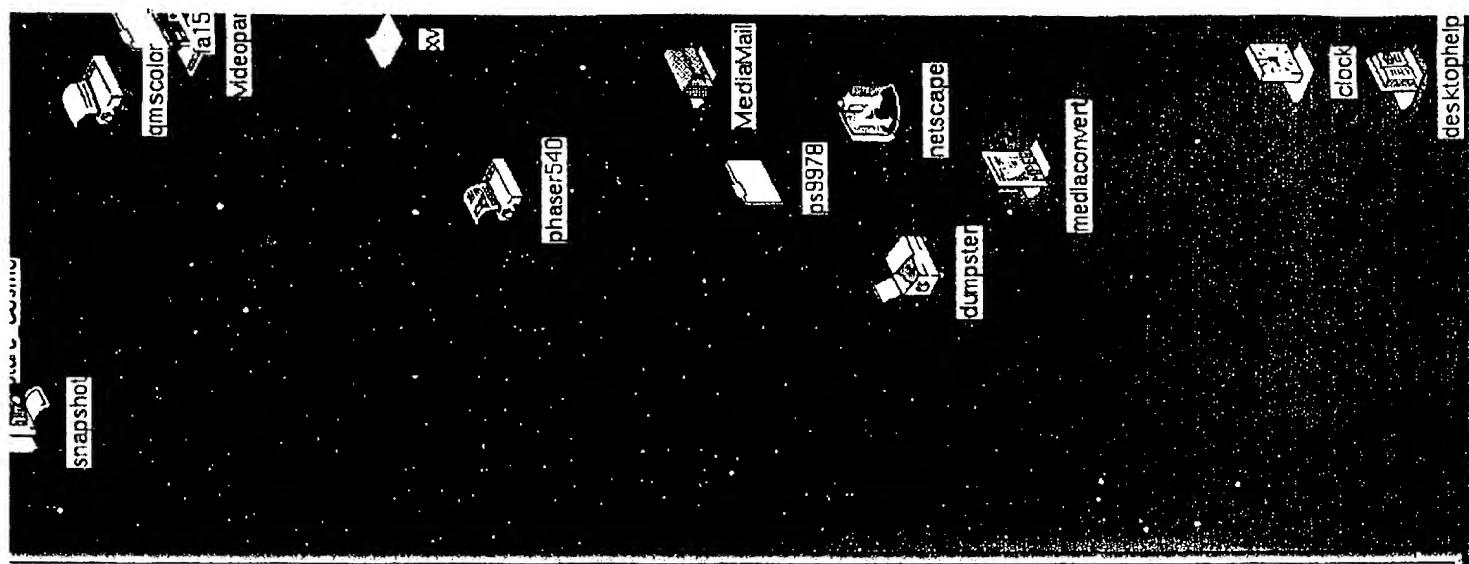
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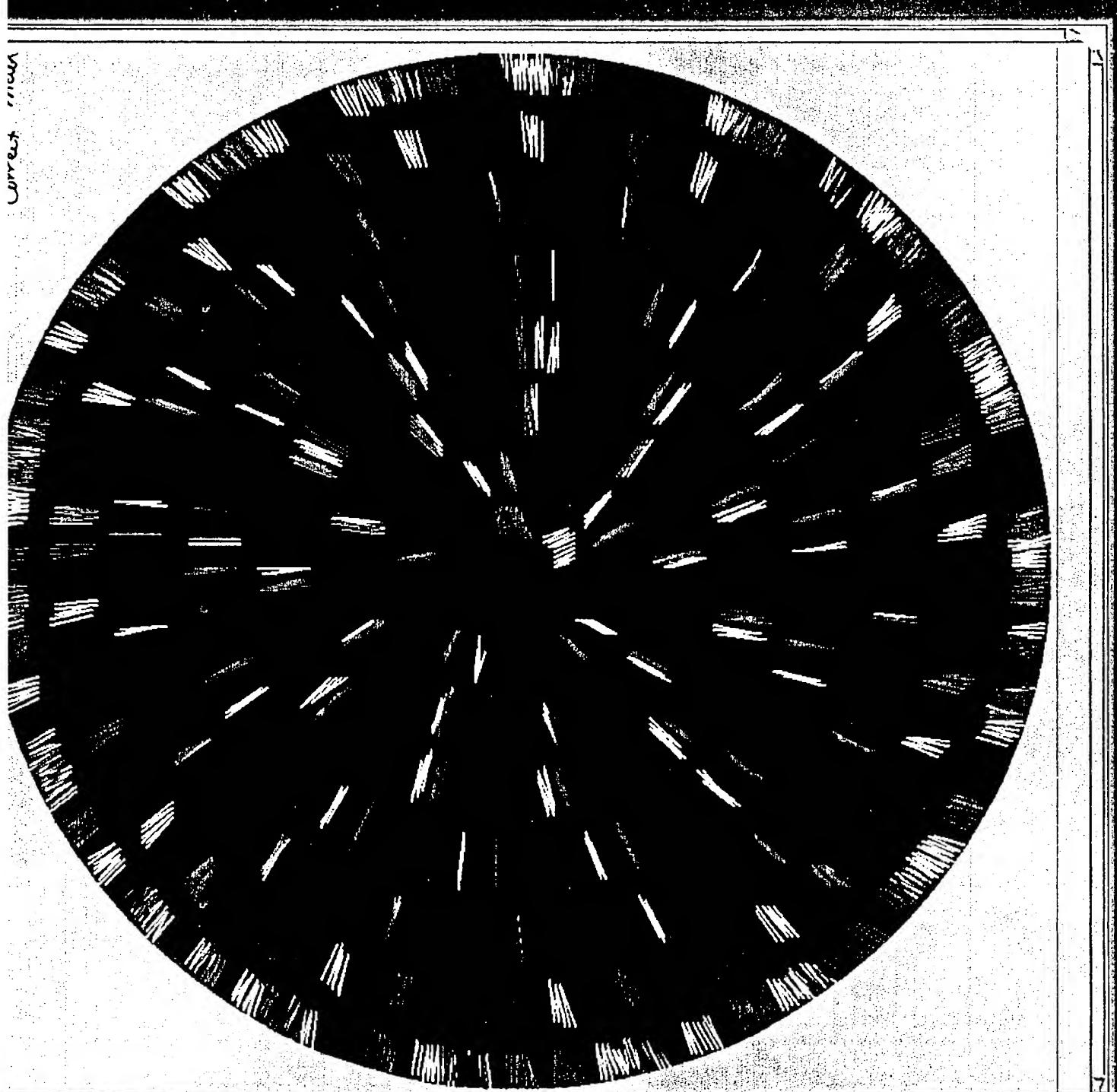
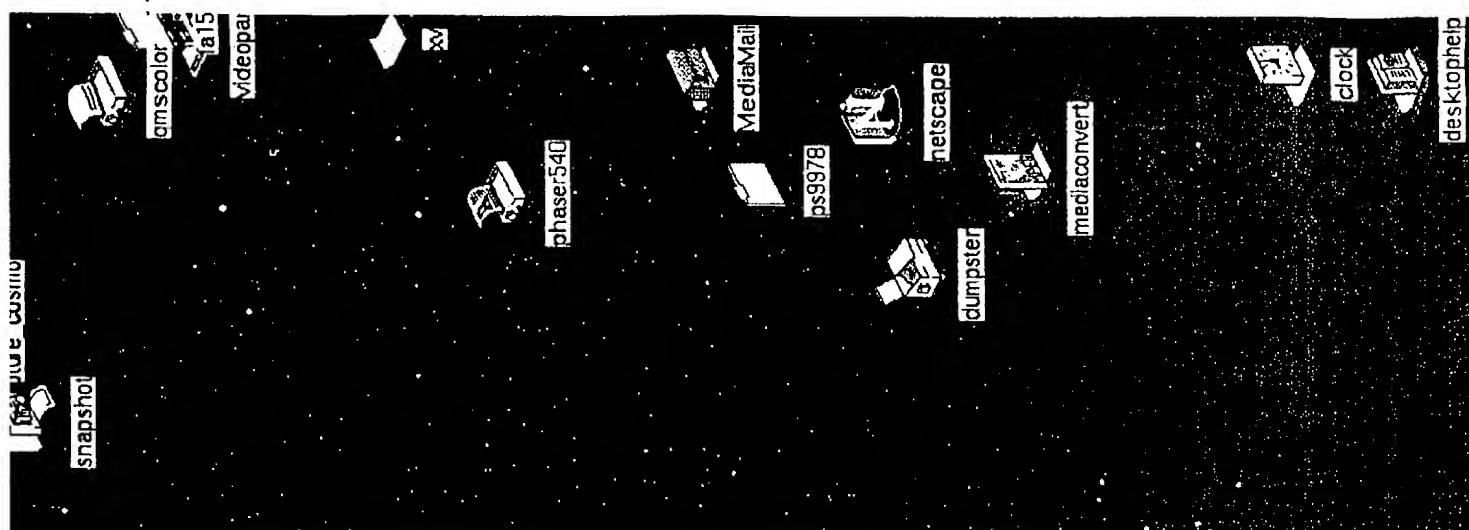


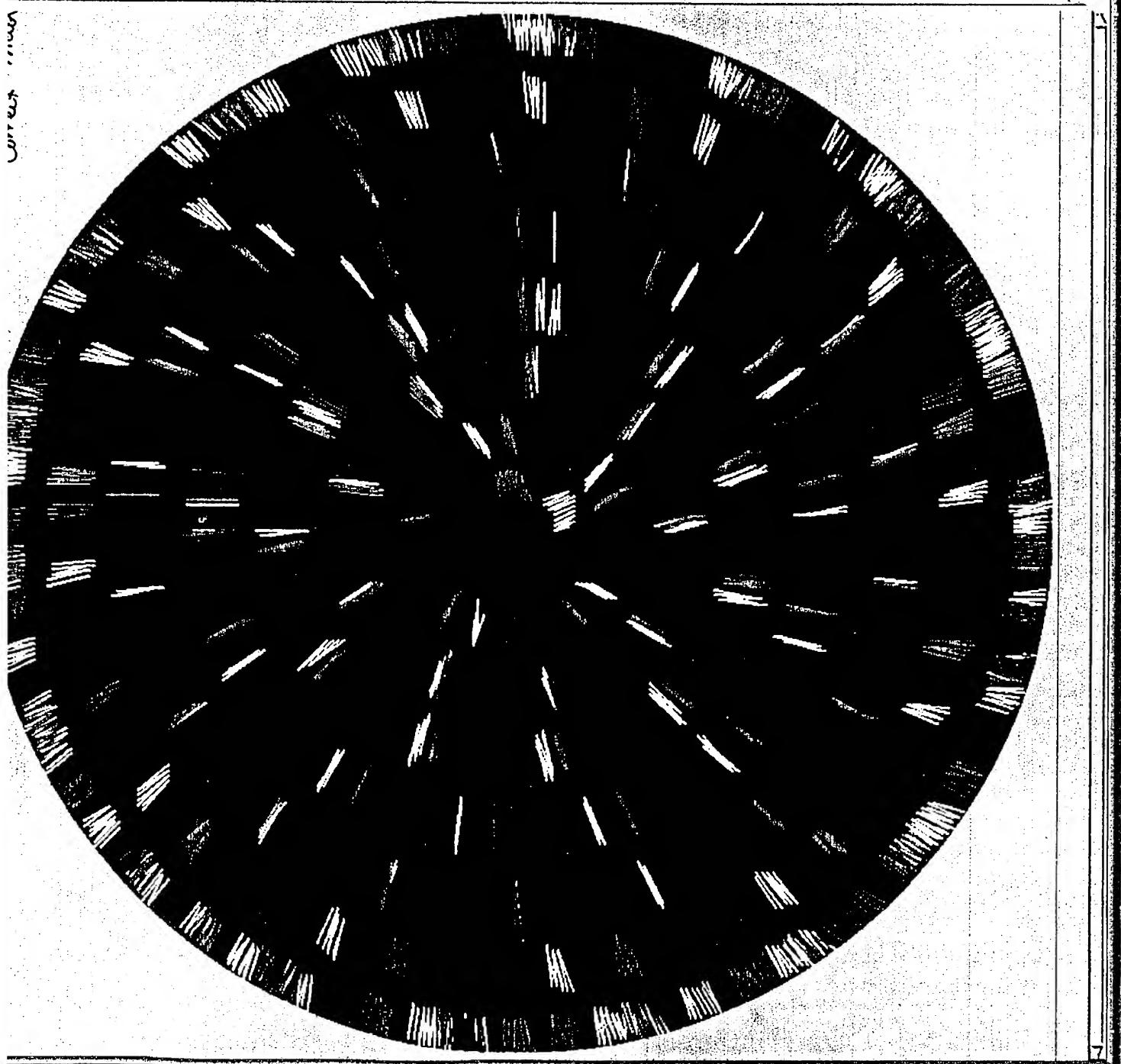
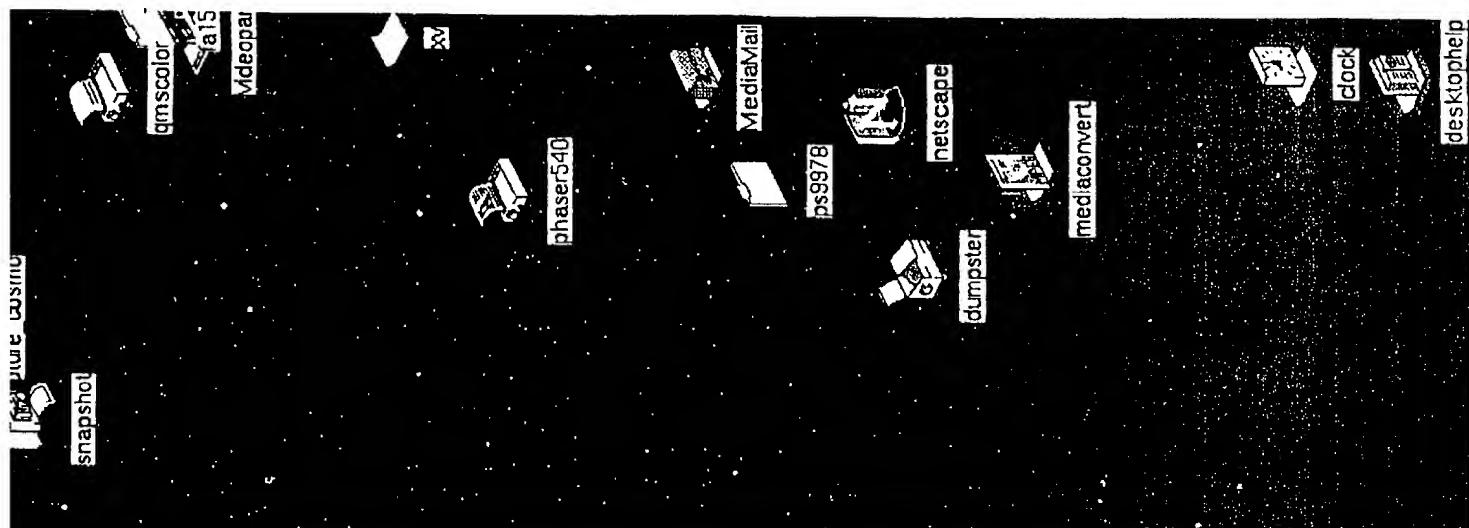


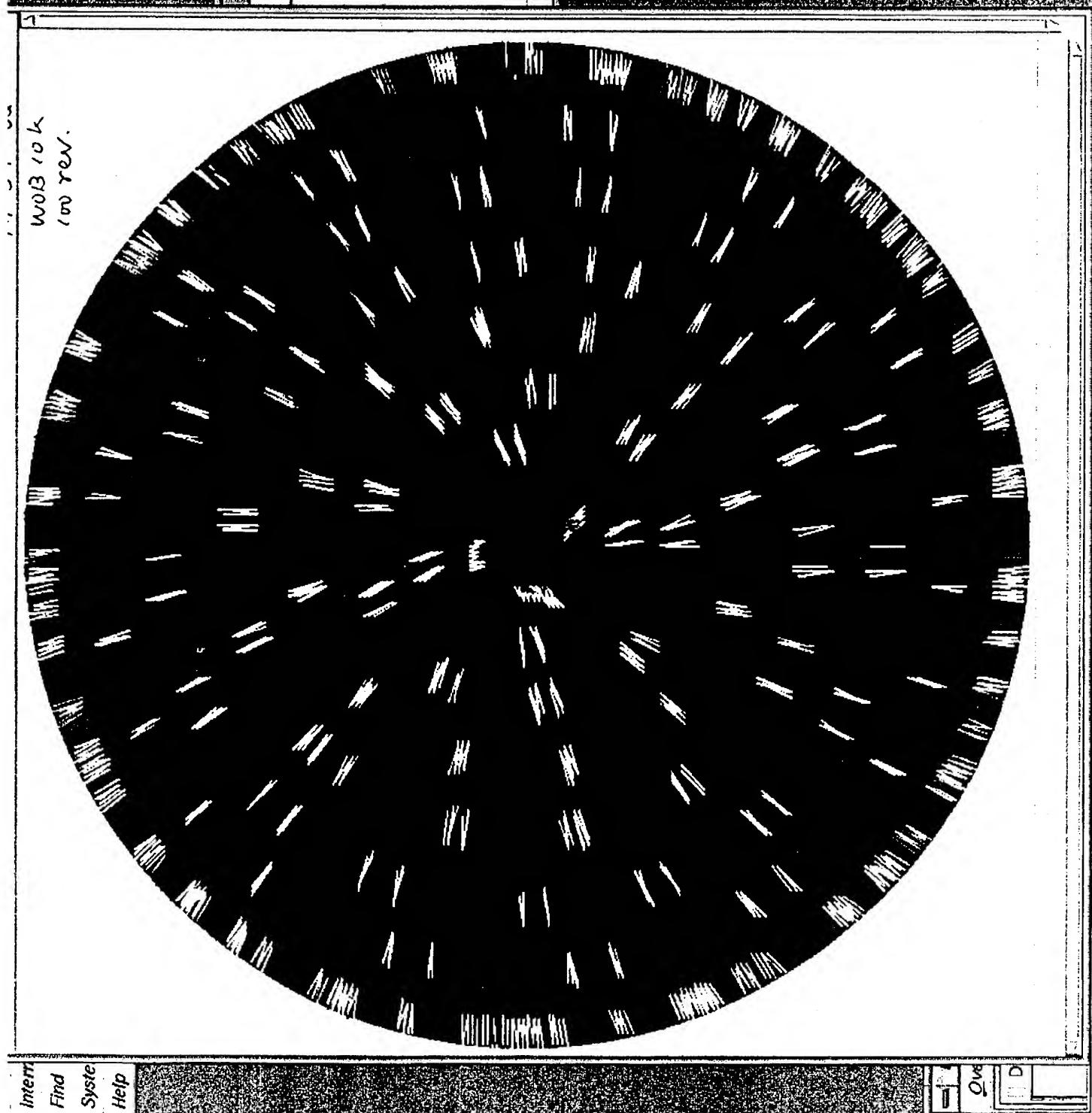
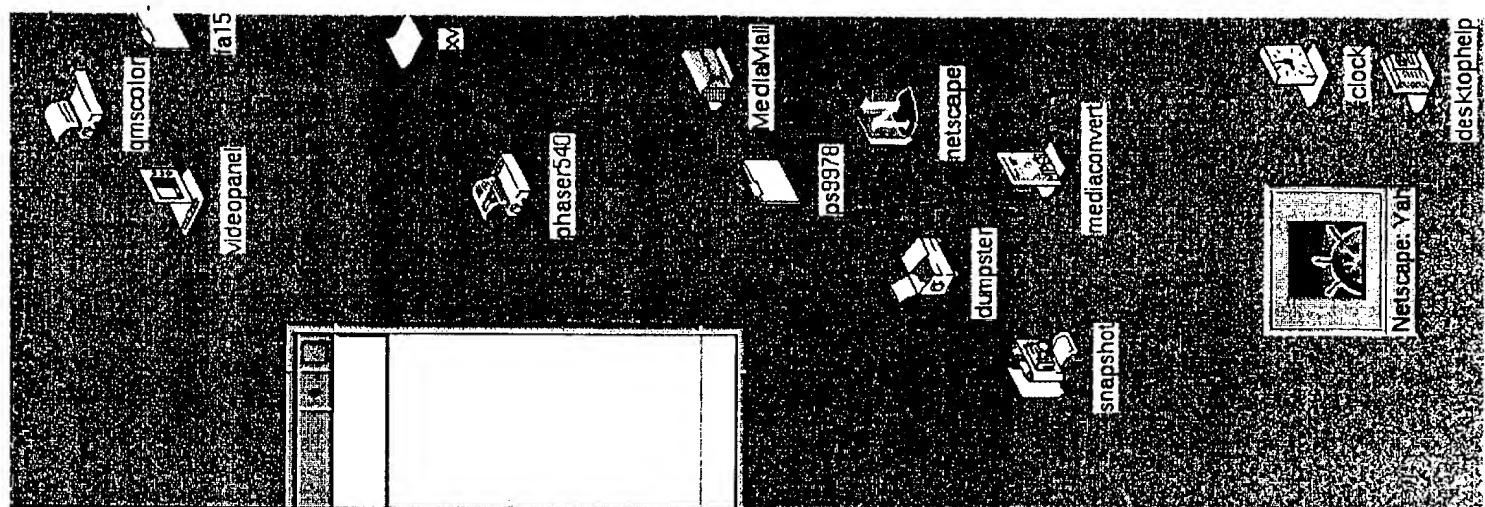












## Calculation Summary

ct: ./f15h1aa  
ter of Bit: 7.87 (in) [200 (mm)]  
t on Bit: 42000 (lbf) [19051 (kgf)]  
utions per minute: 85 (rpm)  
utions of Simulated: 30 (rev)  
ess coefficient of Rock: 134954 (lbf/in<sup>2</sup>) [930.5 (Mpa)]  
ritical Contact Depth of Rock: 0.054 [in] [1.4 (mm)]  
breakage Factor of Rock: 95.006 (Mpa/mm)  
ole area: 48.707 (sq.in)

### CutArea Coverage

(sq.in) %

15.17	31.14
16.91	34.71
18.68	38.35
18.26	37.48
18.62	38.22
20.64	42.37
20.80	42.70
20.67	42.44
20.49	42.06
20.90	42.91
22.05	45.27
20.75	42.60
20.94	42.99
21.75	44.66
21.96	45.08
21.39	43.92
20.92	42.95
21.04	43.19
21.31	43.76
20.39	41.87
20.88	42.87
21.13	43.38
21.04	43.20
20.42	41.93
21.65	44.45
21.18	43.48
21.44	44.03
21.17	43.45
21.24	43.61
21.24	43.61

ge of Coverage for Bit: 42.09 %

ge of Coverage for Each Row:

Row	Rmin (in)	Rmax (in)	C.Avr (sq.in)	CovI %	CovA %
1	3.886	3.937	0.002	0.12	0.00
2	3.726	3.937	0.019	0.36	0.04
3	3.154	3.851	2.148	14.02	4.41
4	2.055	2.815	3.266	28.08	6.71
5	0.773	1.428	0.829	18.30	1.70
6	0.210	0.704	0.034	2.40	0.07
1	3.884	3.937	0.005	0.36	0.01
2	3.484	3.937	1.838	17.40	3.77
3	2.488	3.247	3.813	27.88	7.83
4	1.205	1.852	1.550	24.95	3.18
5	0.229	0.690	0.045	3.38	0.09
1	3.884	3.937	0.003	0.24	0.01
2	3.534	3.937	0.388	4.09	0.80
3	2.832	3.595	3.777	24.51	7.76
4	1.595	2.319	2.497	28.04	5.13
5	0.429	0.972	0.212	8.90	0.44

penetration Depth 0.249 (ft) [76 (mm)]

ge of ROP 38.70 (ft/h) [11.79 (m/h)]

of Cone Rotary Speed to Bit:

Ratio

1.2176  
1.2581  
1.2223  
ing Brittle File Size 5003400 (bytes)  
cal Brittle File Size 3705012 (bytes)  
Contacted Times 849 (times)  
ct Percentage of Shell to Rock 23.5833 %

## Calculation Summary

ct: ./f15h17  
ter of Bit: 7.87 (in) [200 (mm)]  
t on Bit: 42000 (lbf) [19051 (kgf)]  
utions per minute: 85 (rpm)  
utions of Simulated: 30 (rev)  
ess coefficient of Rock: 134954 (lbf/in<sup>2</sup>) [930.5 (Mpa)]  
ritical Contact Depth of Rock: 0.054 (in) [1.4 (mm)]  
breakage Factor of Rock: 95.006 (Mpa/mm)  
ole area: 48.707 (sq.in)

### CutArea Coverage

(sq.in) %

13.15	27.00
13.45	27.62
15.99	32.83
17.90	36.75
19.16	39.34
18.72	38.44
18.10	37.16
19.03	39.08
19.44	39.92
18.89	38.77
19.97	41.01
19.35	39.72
18.09	37.13
18.30	37.58
18.84	38.69
18.07	37.09
19.37	39.77
19.20	39.41
19.96	40.98
19.21	39.44
19.38	39.79
20.33	41.74
18.94	38.88
19.49	40.01
19.73	40.51
19.20	39.42
19.99	41.04
19.19	39.40
20.25	41.57
19.06	39.14

ge of Coverage for Bit: 38.31 %

ge of Coverage for Each Row:

Row	Rmin (in)	Rmax (in)	C.Avr (sq.in)	CovI %	CovA %
1	3.907	3.937	0.000	0.00	0.00
2	3.318	3.937	1.161	8.22	2.38
3	2.884	3.572	2.868	20.54	5.89
4	1.377	2.045	2.072	28.87	4.25
5	0.105	0.554	0.064	6.85	0.13
1	3.890	3.937	0.000	0.00	0.00
2	3.323	3.937	2.096	14.95	4.30
3	1.848	2.593	2.978	28.63	6.11
4	0.454	1.014	0.367	14.24	0.75
1	3.907	3.937	0.000	0.00	0.00
2	3.321	3.937	1.707	12.15	3.50
3	2.387	3.150	3.813	28.75	7.83
4	0.899	1.533	1.316	27.14	2.70

enetratation Depth 0.149 (ft) [45 (mm)]

ge of ROP 23.44 (ft/h) [7.14 (m/h)]

of Cone Rotary Speed to Bit:

Ratio

1.2623

1.2214

1.2788

ing Brittle File Size 3660912 (bytes)  
cal Brittle File Size 2933052 (bytes)  
Contacted Times 1694 (times)  
ct Percentage of Shell to Rock 47.0556 %

# Peer Review

**Project Information:****Page: 1**

Title: 077 mf15h

Number: CS-P-15

Leader(s): YING XIANG

**Meeting Schedule:**

Date: Mar.30, 1999

Time: 9.00AM

Place: ROOM2000

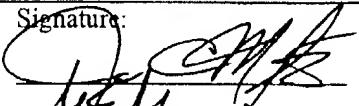
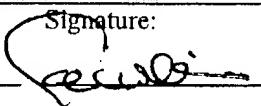
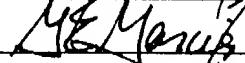
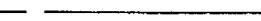
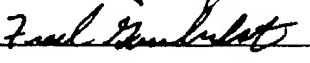
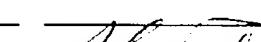
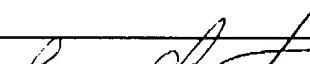
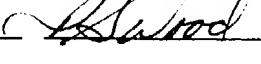
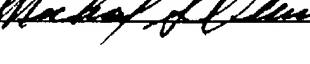
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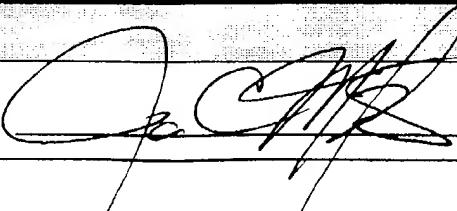
► Design review

►

►

**Agenda Topics****Time Allotment**► Review Product Brief  PDP  ECR  CAR  EPA ► Review 077-mf15h -93 Layout ► open discussion ► ► ► ► Recap Meeting and Action Items **Invitees: (Attendance indicated by signature)**

Name:	Signature:	Name:	Signature:
Jim Minikus		John Williams	
Mary Garcia		Dennis Cisneros	
Red Garbrecht		Gary Portwood	
Scott McDonough		Paul Wood	
Ryan Chenevert			
Mike Oliver			

**Design Review Result:** Unconditional Approval  
(No change required) Conditional Approval  
(Action items must be completed) Another Design Review Required  
(Redesign and conduct another design review)**Verification:**Manager/Supervisor Signature: 

Date: 12 APR 99

# Peer Review

## Project Information:

Page: 2

Title: 077mf15h

Number: CS-P-15

Date: March 30, 1999

## Action Items:

1) ~~FORGING LOCATION INCORRECT ON LAYOUT (ADJUST TO CORRECT LOCATION → REF - 03 LAYOUT)~~

Action Taken: Correct it to the right position.

2) ADJUST HEEL ANGLE TO ALLOW HEEL INSERT TO BE DRILLED ON "FLAT" SURFACE

Action Taken: did it.

3) VERIFY 3D CLUSTER CLEARANCES.

Action Taken: 3D cluster clearance is checked, it is ok.

4) ADD MILLING TO NO. 1 CONE "B" ROW (MILLES FLAT)

Action Taken: Yes, did it.

Action Taken:

5) ADJUST START ANGLES ON # 1D, 1F, 2E, 3C & 3E ROWS

Action Taken: Yes, changed.

Action Taken:

6) ADJUST HOLE DEPTH ON # 1E TO HOLE - STANDARD (HOLE DEPTH IS DEEPER THAN .280 SHOWN IN THE INSERT TABLE).

Action Taken: No need anymore since changed flat heel.

7) REMOVE RADIUS FROM CONE BACKFACE TO HEEL SURFACE TRANSITION.

Action Taken: Yes, did it.

Action Taken:

8) USE 510 GRADE ON 2D ROW (GAGE)

Action Taken: Yes, did it.

## Action Items Addressed:

Project Leader's Signature: Yi-jing Xie Date: 4-12-99

# Peer Review

## Project Information:

Page: 13

Title: 077mf15h

Number: CS-P-15

Date: March 30, 1999

## Action Items:

9) CHANGE HEEL TO "FLAT" & "FLUSH" STYLE SIMILAR TO  
PREVIOUS C.R.'S (5630, 5680, 5743). USE  $3/16$ " Ø IN #1 CONE (IF NECESSARY).

Action Taken:

Yes. did it.

10) INCREASE GROOVE RADIUS ON 2C-0 GROOVES.

Yes. did it.

Action Taken:

## Action Items Addressed:

Object Leader's Signature: X3 X2 Date: 4-12-99

## CONFIDENTIAL &lt;&lt; ER TEST PLAN &gt;&gt; FOR INTERNAL USE ONLY &lt;&lt;

Number: 5754		INCOMPLETE		04/13/99	Date Revised: 04/13/99
077	Type: MF15H	Mfr: STC	EO: 23482	Project: CS-P-15	Product Type: RDF
1:	BOM 2:	BOM 3:	Plant:	Project Engineer: YING XIANG	
FTR: NEW CUTTING STRUCTURE					

## Description:

Cutting structure design based on ideas analysis tools. three gages rows on three cones are in the different locations, with different diameters, gages, and grades. The profile is very different from existing f15h bit.

ISSUED

APR 21 1999

ENGRG. HOUSTON

Entered DRB Date: 00/00/00	Quantity of Runs for Rigorous Test Analysis:		
Origination Date: 00/00/00	PM Prioritization Date: 00/00/00	DDQP Date: 00/00/00	EO Completion Date: 00/00/00

## DISTRIBUTION OF RIGOROUS TEST BITS

District Code	District Name	Est. Production	Quantity
		00/00/00	

## DESIGN OVERVIEW

## Needs Comments:

ROP from reed 51x bit

## Market Comments:

P51X and HP51XM

## Risk and Measures Comments:

Market share of f15h bit, using ideas program as tool for new cutting structure development

**CONFIDENTIAL <<****ER TEST PLAN****>> FOR INTERNAL USE ONLY <<****Location and Lithology Comments:**

Try it first in the area where f15h standard bit drills softer formation, such as Canada, if the cutting structure holds itself, then it should be able to be used in other tough f15h bit area.

**Drilling Practices and Conditions Comments:**

f15h drilling practices should work for this bit

**ISSUED****APR 21 1999****ENGRG. HOUSTON****SPECIFIC DESIGN CHANGES/FEATURES****Description of each Change or Feature:**

bit is total different from our standard f15h bit in inserts counts, row counts.

**Objective of each Change or Feature:**

Develop a bit which can compete with 51x without mud pick feature

**FIELD ENGINEERING INSTRUCTIONS****Additional Parameters for ER Test Comments:**

as standard F15H and benchmark bits.

**Reporting, Analysis, and Evaluation Requirement Comments:**

conditions, wear resistance, and ROP are the most important for evaluation

**Bit Return Requirement Comments:**

In every bit to Houston for evaluation.

**DESIGN REVIEW BOARD****al DRB Date: 00/00/00****DRB Results:****Design Review Board Comments:**

ISSUED

4-21-1999

IG. HOUSTON

ENGINEERING ORDER  
Ponca

NO. 23482

SHEET 1 OF 1

E.C.R. NO.

REQUESTED DATE: 4-20-99

E.R. NO. 5754

<input type="checkbox"/> NEW PRODUCT	<input checked="" type="checkbox"/> NEW B.O.M. NO.	<input type="checkbox"/> B.O.M. CHANGE	<input type="checkbox"/> FORGING CHANGE
<input type="checkbox"/> NEW BEARING NO.	<input checked="" type="checkbox"/> NEW PART NO.	<input type="checkbox"/> PART CHANGE	<input type="checkbox"/> STATUS CHANGE
<input type="checkbox"/> NEW FORGING NO.	<input checked="" type="checkbox"/> NEW DWG. NO.	<input type="checkbox"/> DWG. CHANGE	<input checked="" type="checkbox"/> PRODUCT REDESIGN

SIZE / TYPE 077 MF154

BEARING NO. 525-0580

TITLE new MF154 type bit design. different from other F154 designs.

PROJECT NO. CS-P-15

## DESCRIPTION:

Create a new MF154 bit cutting structure (BOM 00244-98). Three gage rows on three cones are at the different locations. #1 cone uses SET gage insert, two and three cones use RGs type inserts. New cone assemblies, and new cone profile & drilling are required. One new insert required (P/N 0024678), which is the same shape and dimension as part 0022626, but different grade.

finished bits are to be marked on the top of the pin and on the bit box as ER 5754, which uses as the bit type.

NEW	SUPERSEDES	OLD	NEW	SUPERSEDES	OLD
0024398					

REASON: Research development product

## DISPOSITION OF AFFECTED PARTS:

DRAWING NO.	REV. LTR.	DRAWING NO.	REV. LTR.	PART NO.	REV. LTR.	BOM AFFECTED	REV. LTR.	PREPARED BY:
#1 Assy		204326		0024679		0024598		<i>Bobby Daniel</i>
#2 Assy		204327		0024680				
#3 Assy		204328		0024681				
#1 P&D		204323						
#2 P&D		204324						
#3 P&D		204325						
Insert		0024678		0024678				

APPROVED BY:

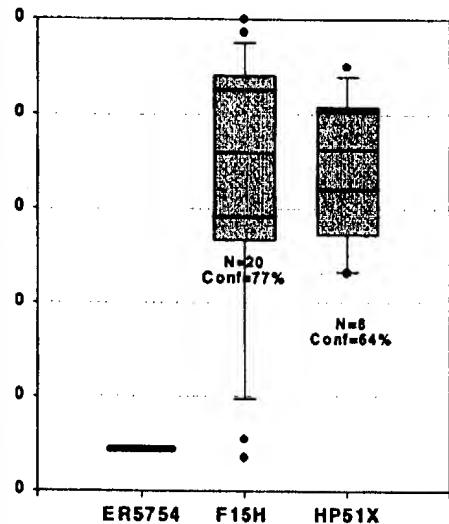
*J. X. X.*

DATE: 4-20-99

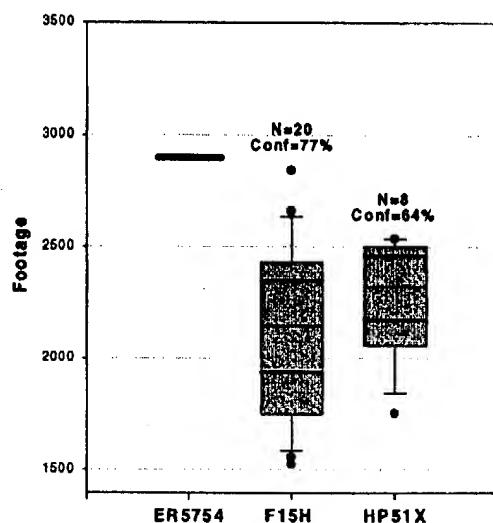
CONFIGURATION  
MANAGEMENT:*S. Schindler*

11-71-99

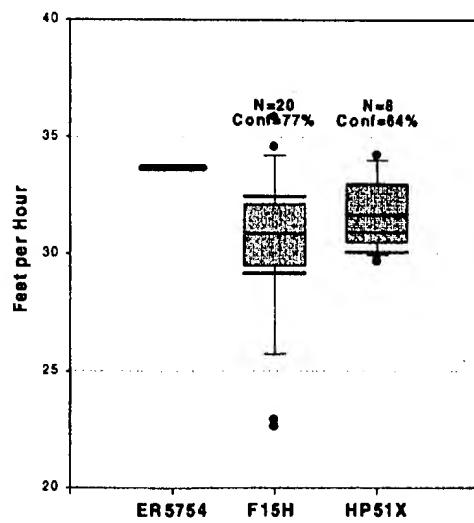
**Depth In Comparison**  
**ER5754 - LX4911**



**Footage Comparison**  
**ER 5754 - LX4911**



**ROP Comparison**  
**ER5754 - LX4911**



# ER5754

ER5754 came from a project named “HP51X killer” in 1999

It was the first bit designed fully using IDEAS

It hits homeruns in the fields of U.S. and Canada

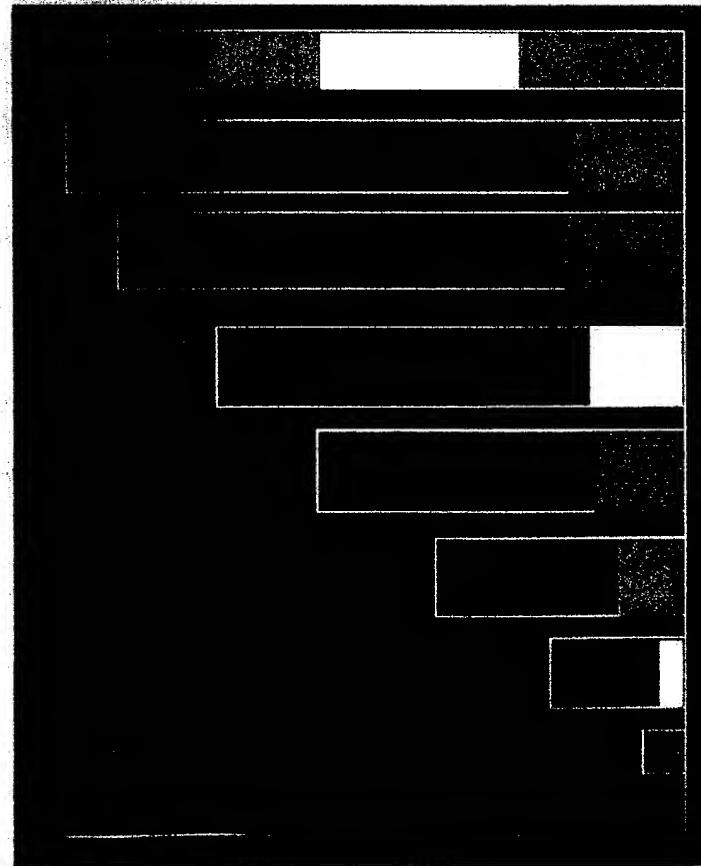
It is also a HP53X killer

## THE FIRST IDEAS BIT



IDEAS™ Bit Design: 7 7/8 ER 5754

*Bottom Hole Coverage Pattern*

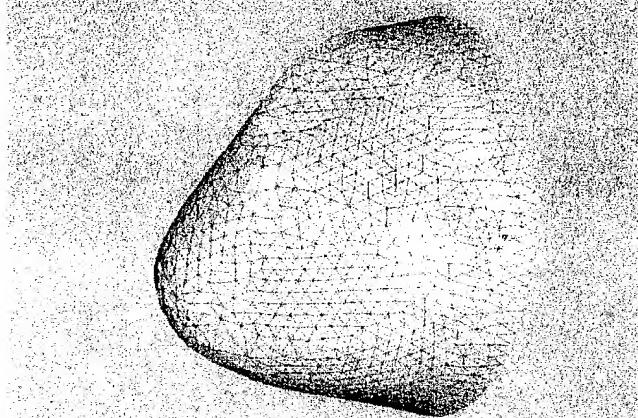
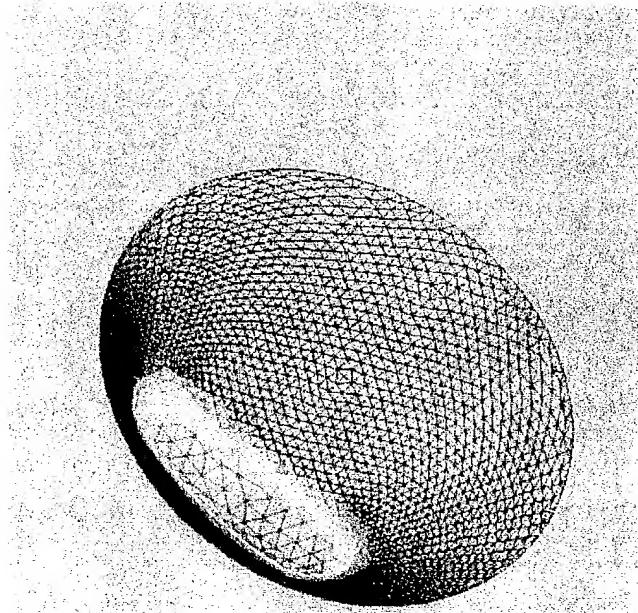


SND 7 7/8 F15H

ER 5754

# Bit Optimization

*Insert Sharpness, Shape, Counts And Wear Resistance*

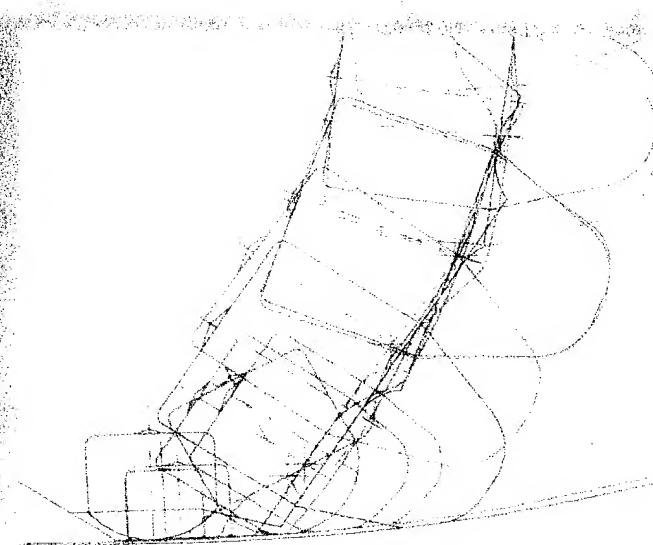


# IDEASTM Bit Design: 7 7/8 ER 5754

## STD FISH ER 5754

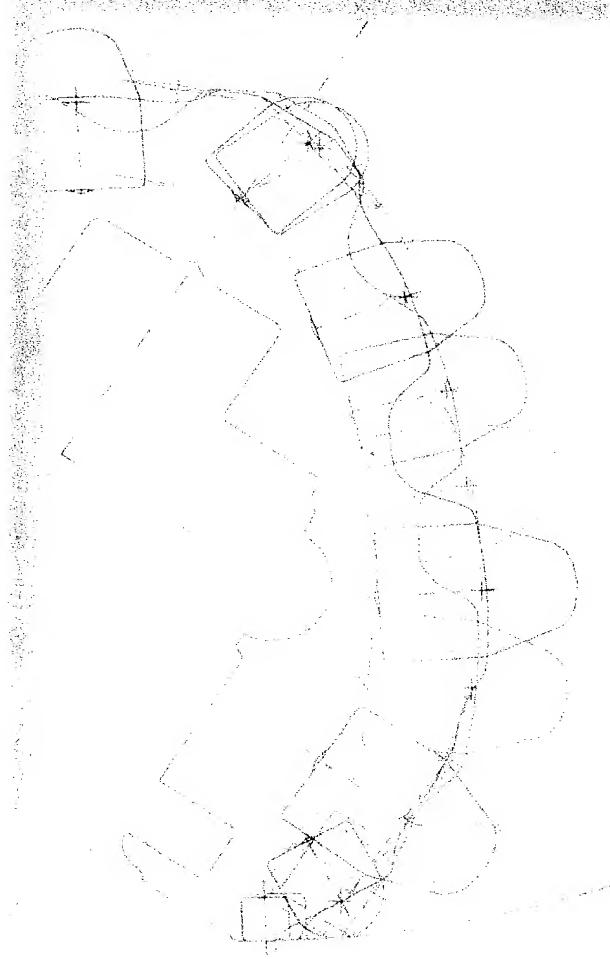
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WOB	42k	42k
RPM	85	85
Rop/ideas	23.44	38.7
Rock Type	Shale	Shale
Bit Coverage	38%	42%
Bit Offset	.188	.219
Insert Count	104	130
Row Count	11	13
Insert Ext.	.37	.38



# IDEAS™ Bit Design: 7 7/8 ER5754

- Increased bit offset .219 vs. .188
- Unique gage configuration
- Aggressive profile with increased bottom hole coverage
- Sharper inner row insert
- Balanced cone-bit ratios
- Vertical force balanced
- Bottom hole pattern optimization



# Bit Optimization

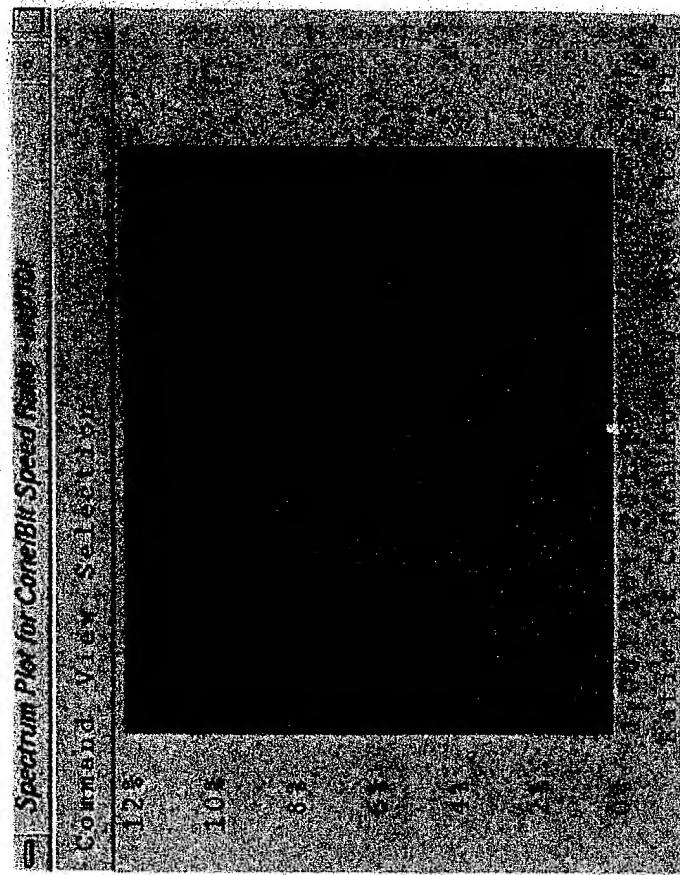
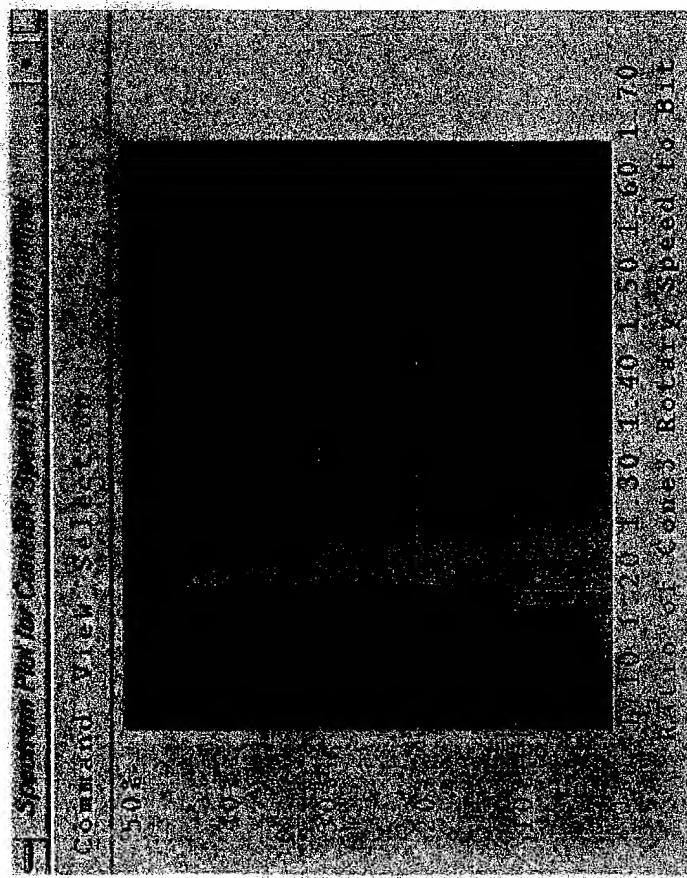
- Profile design
- Bottom hole pattern
- Insert sharpness, shape, counts and wear resistance
- Gage inserts configuration and efficiency
- General bit geometry

# Bit Optimization

- Profile design
- Bottom hole Pattern
- Insert sharpness, shape, counts and wear resistance
- Gage inserts configuration and efficiency
- General bit geometry

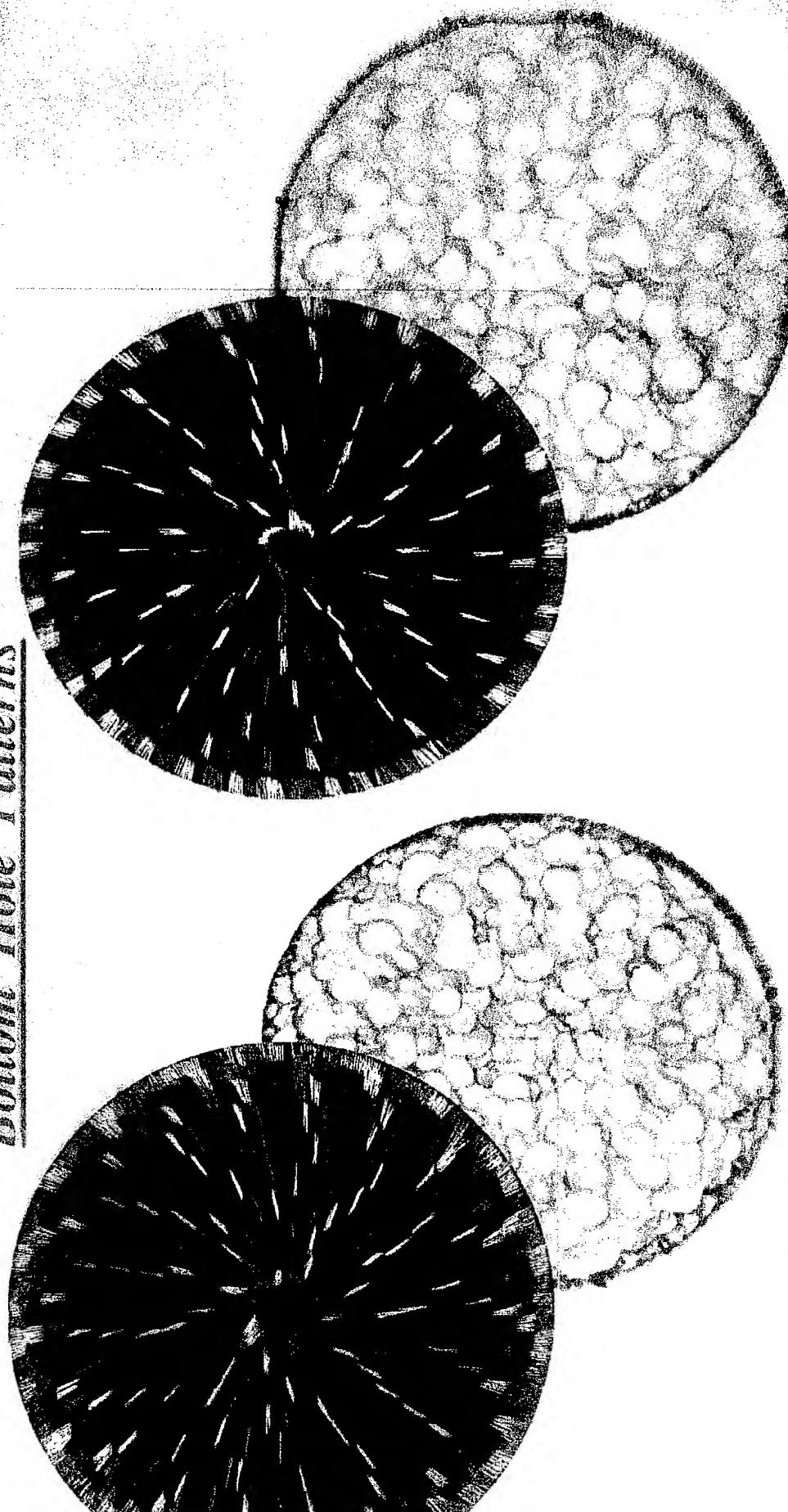
# Bit Optimization

## Bit/Cone Rotation Ratio



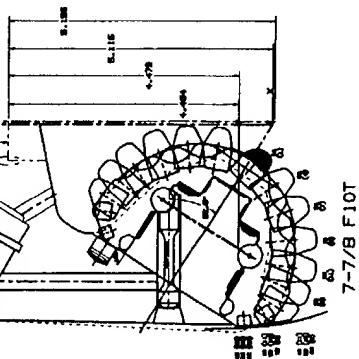
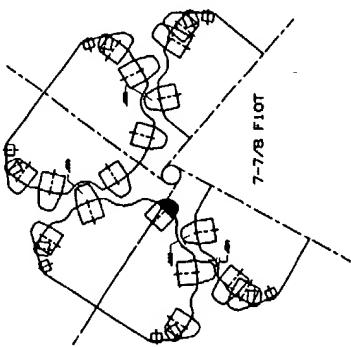
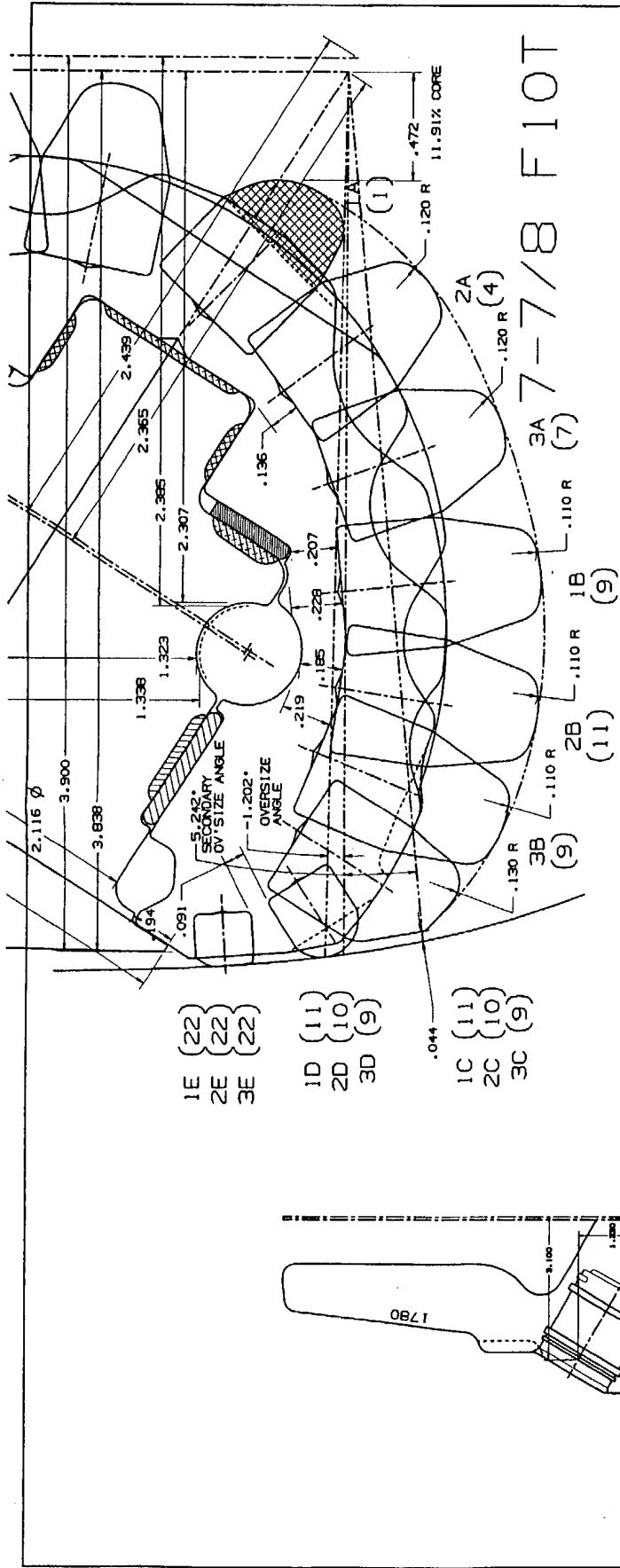
**IDEAS™ Bit Design: 7 7/8 ER5754**

*Bottom Hole Patterns*



**Standard 7 7/8 FISH**

**ER 5754**

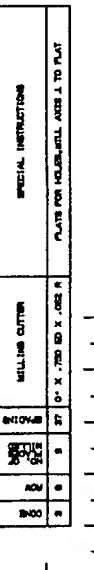
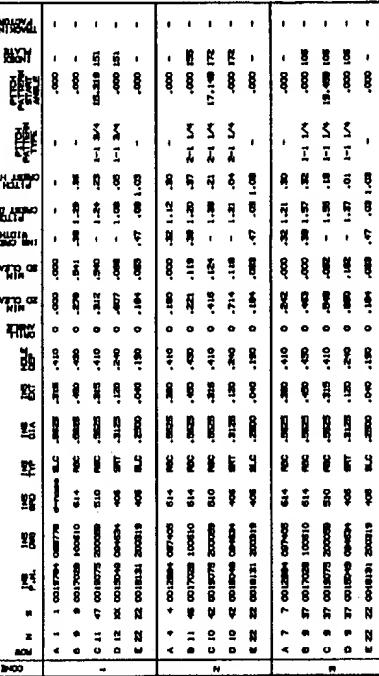
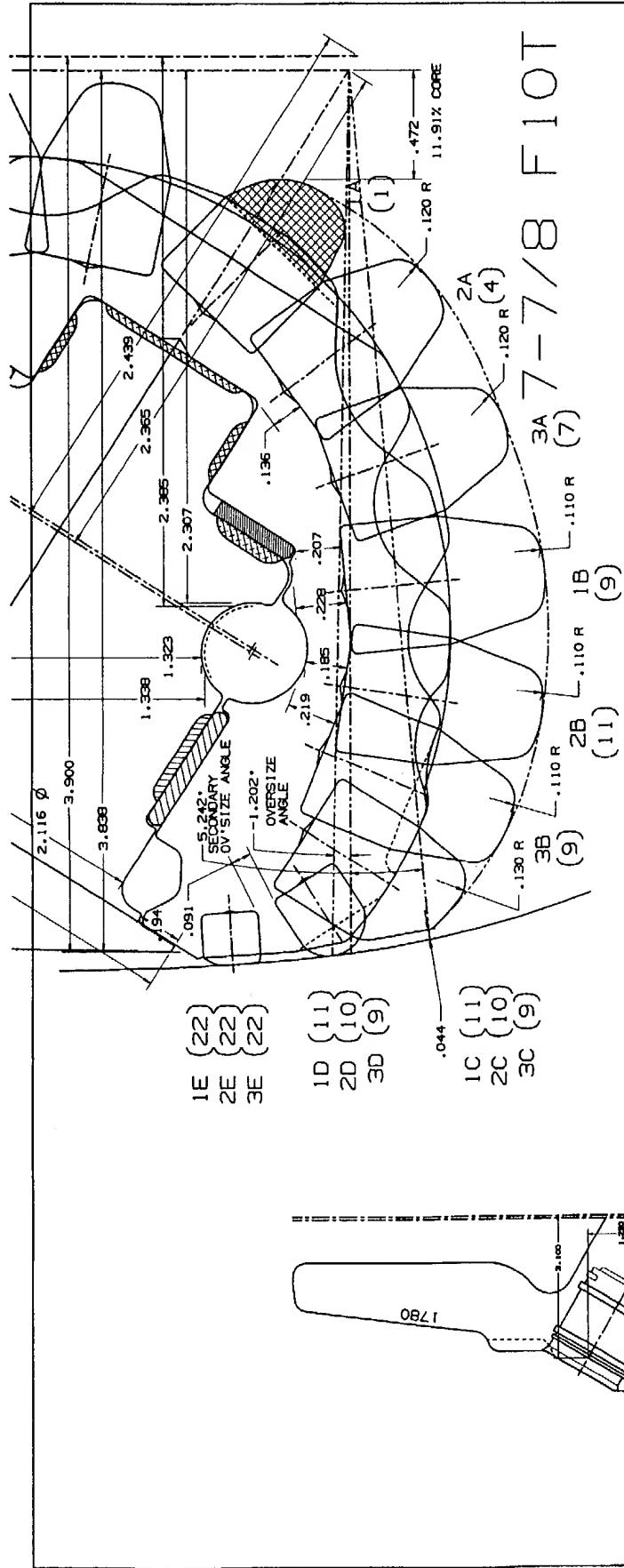


DRILL/MILL ENTITIES ARE CURRENT

1001

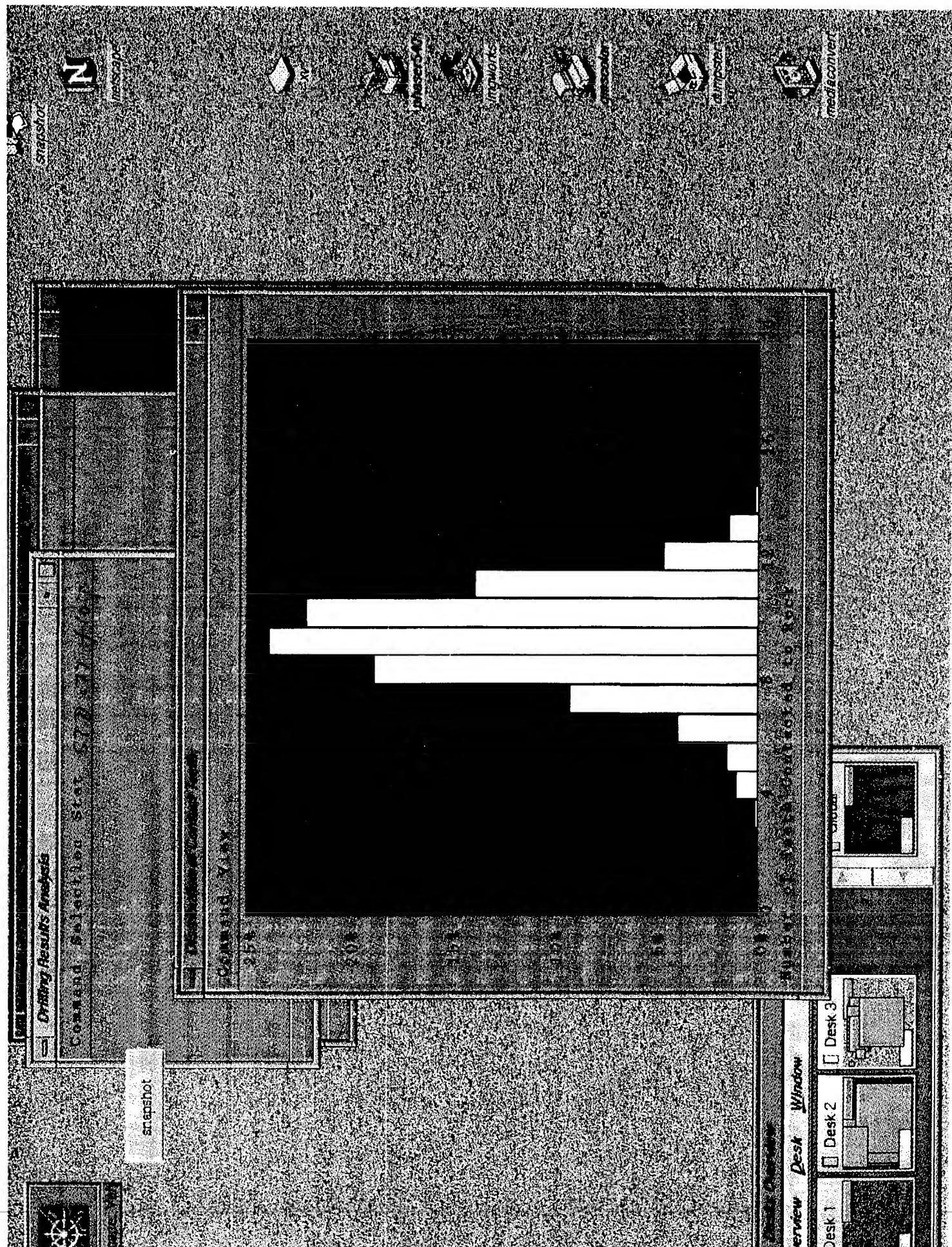
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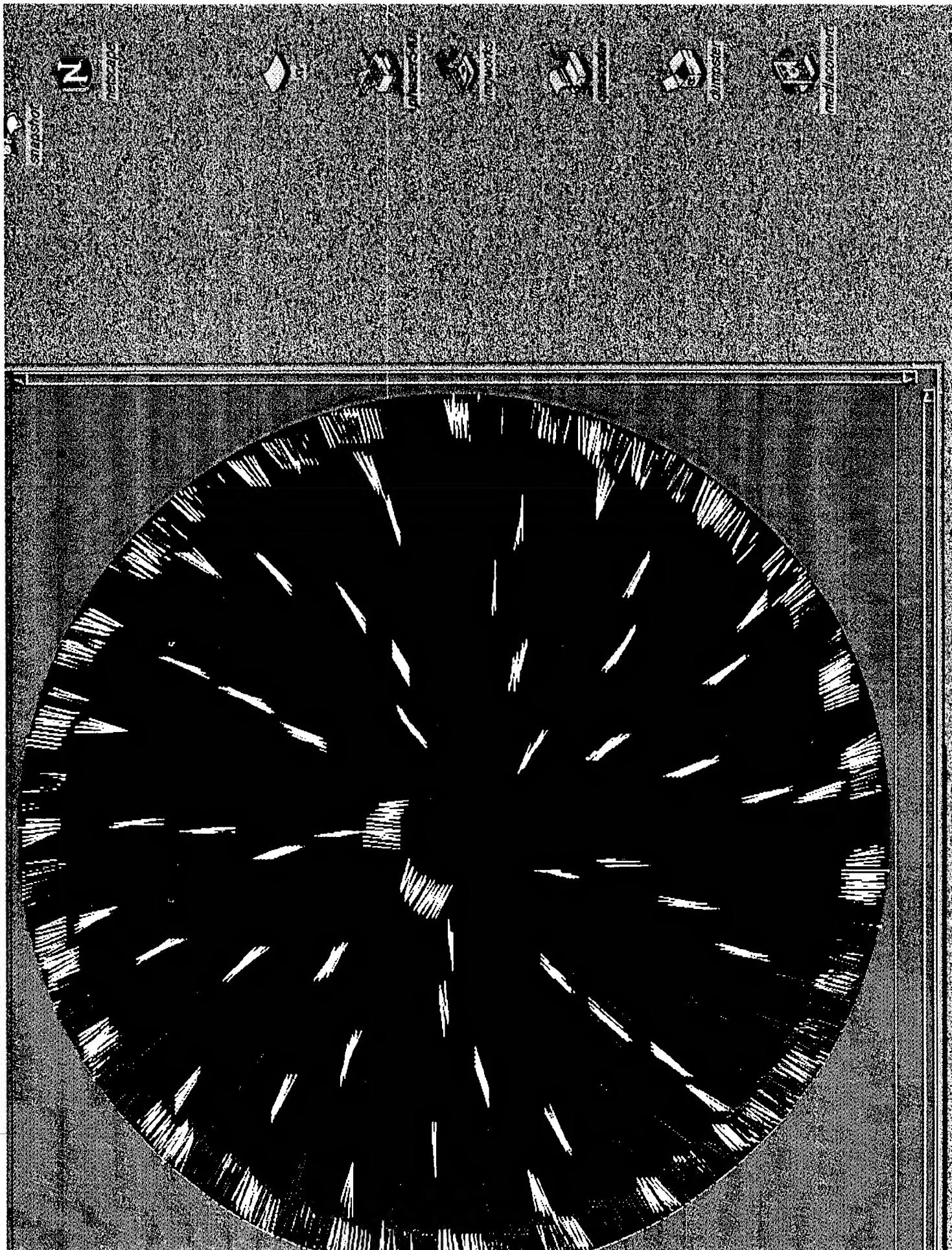
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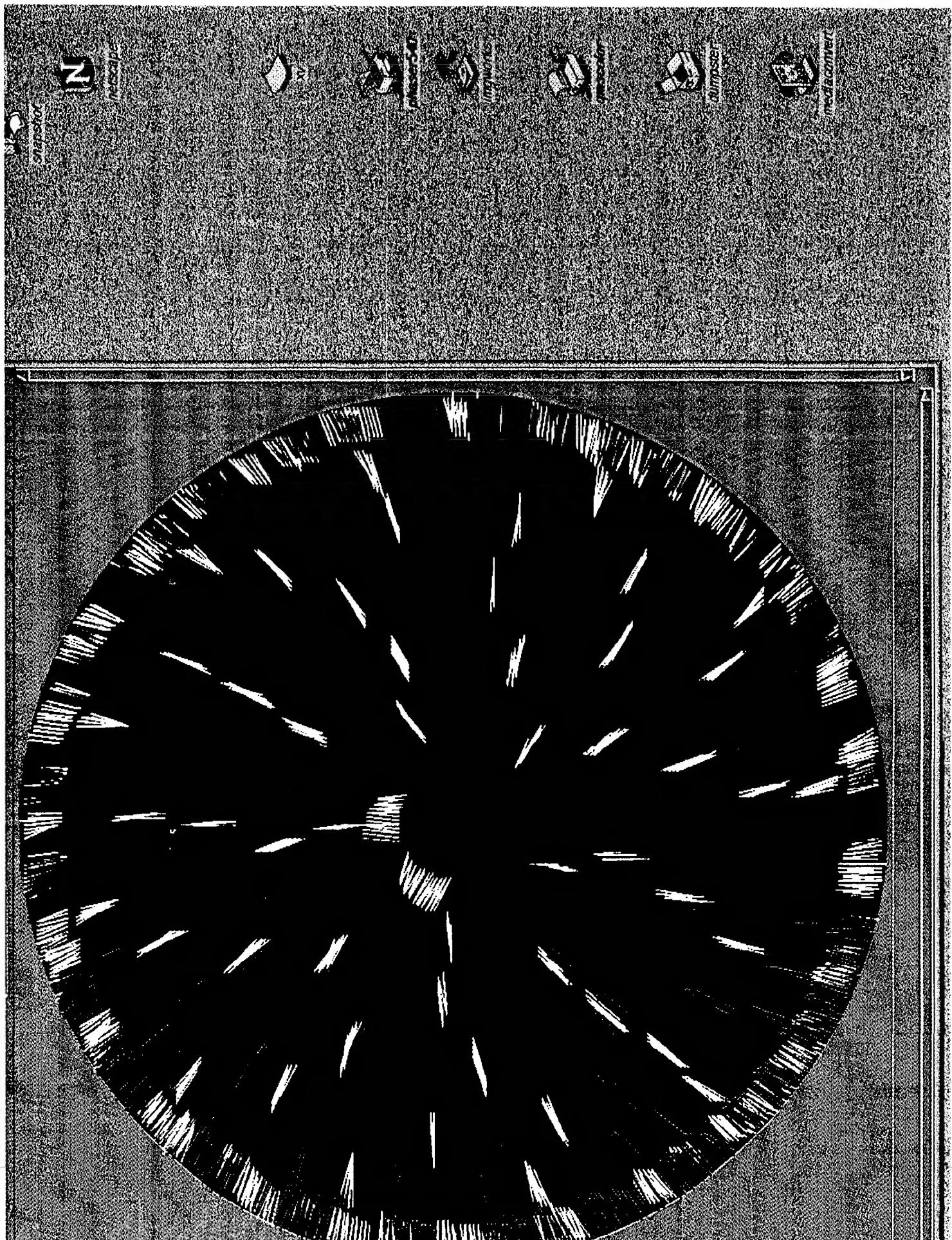


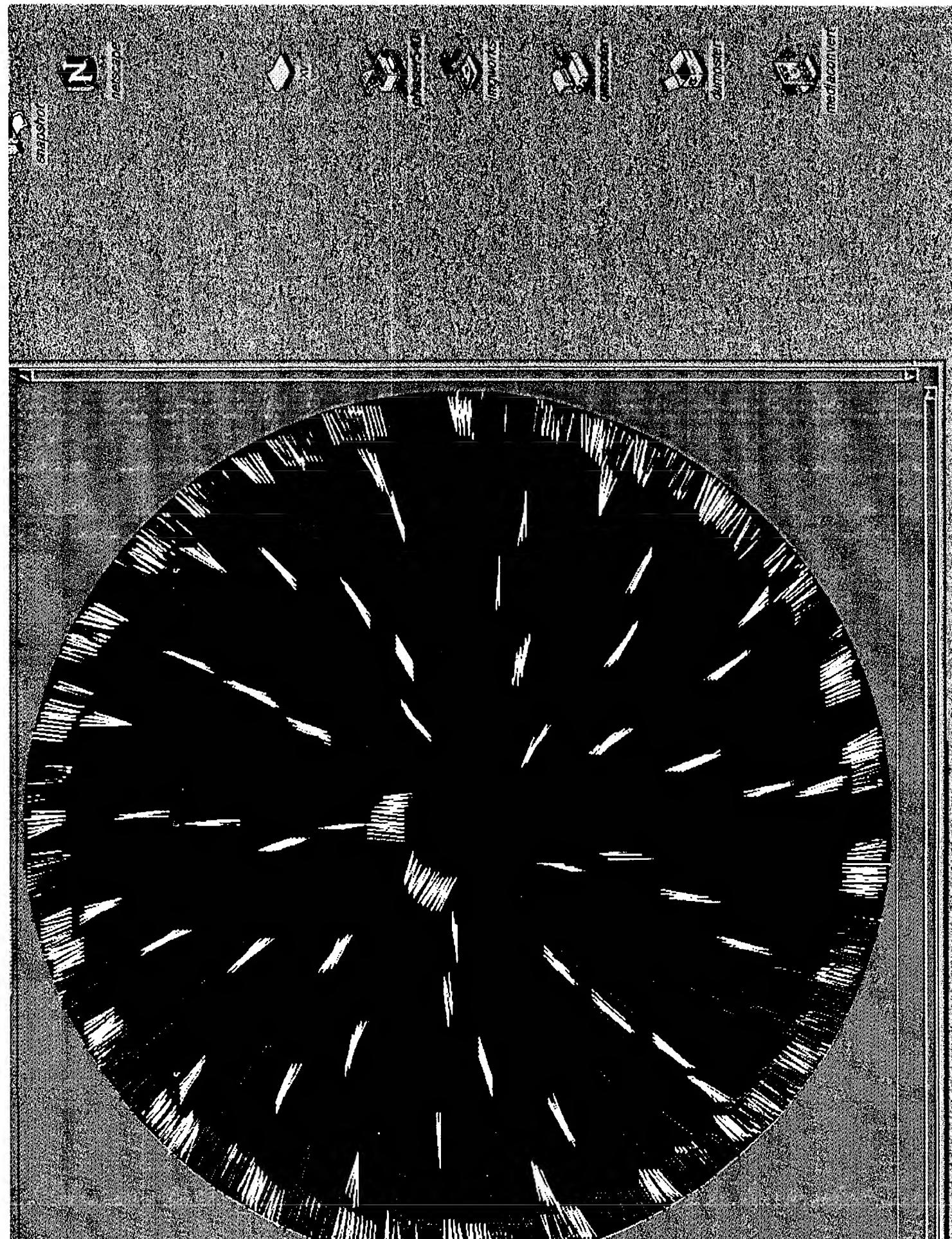
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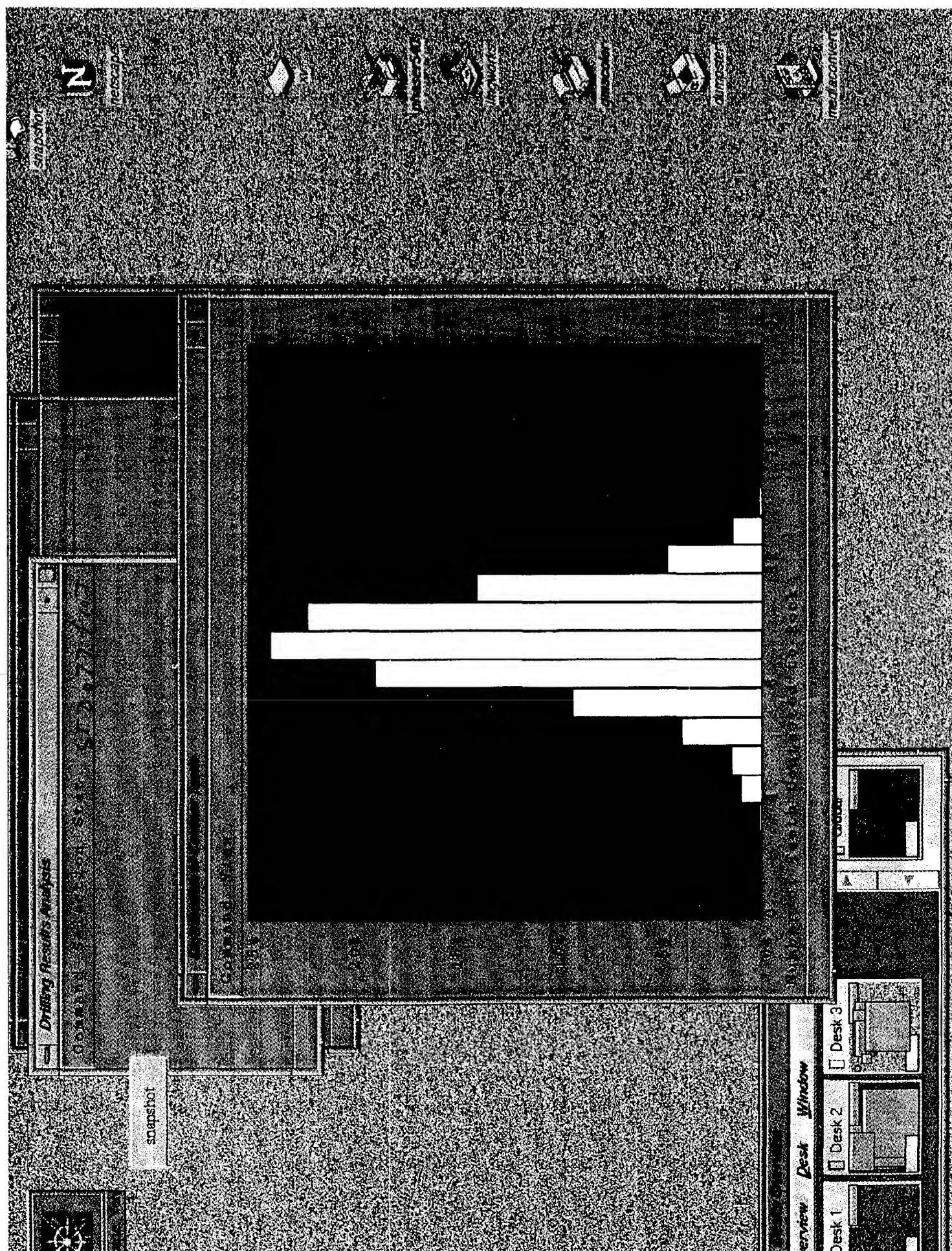
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EQUITY OWNERSHIP - 100%

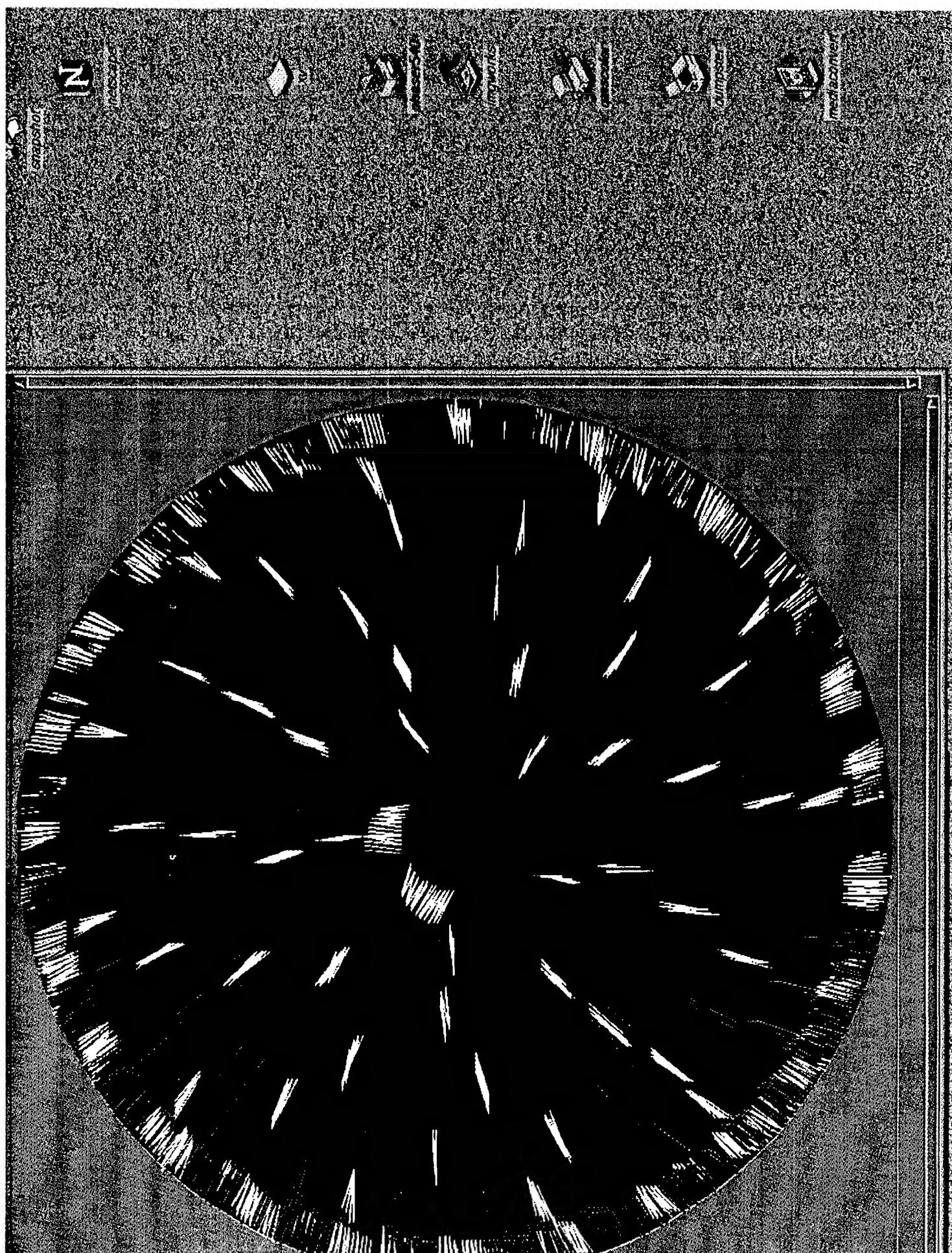


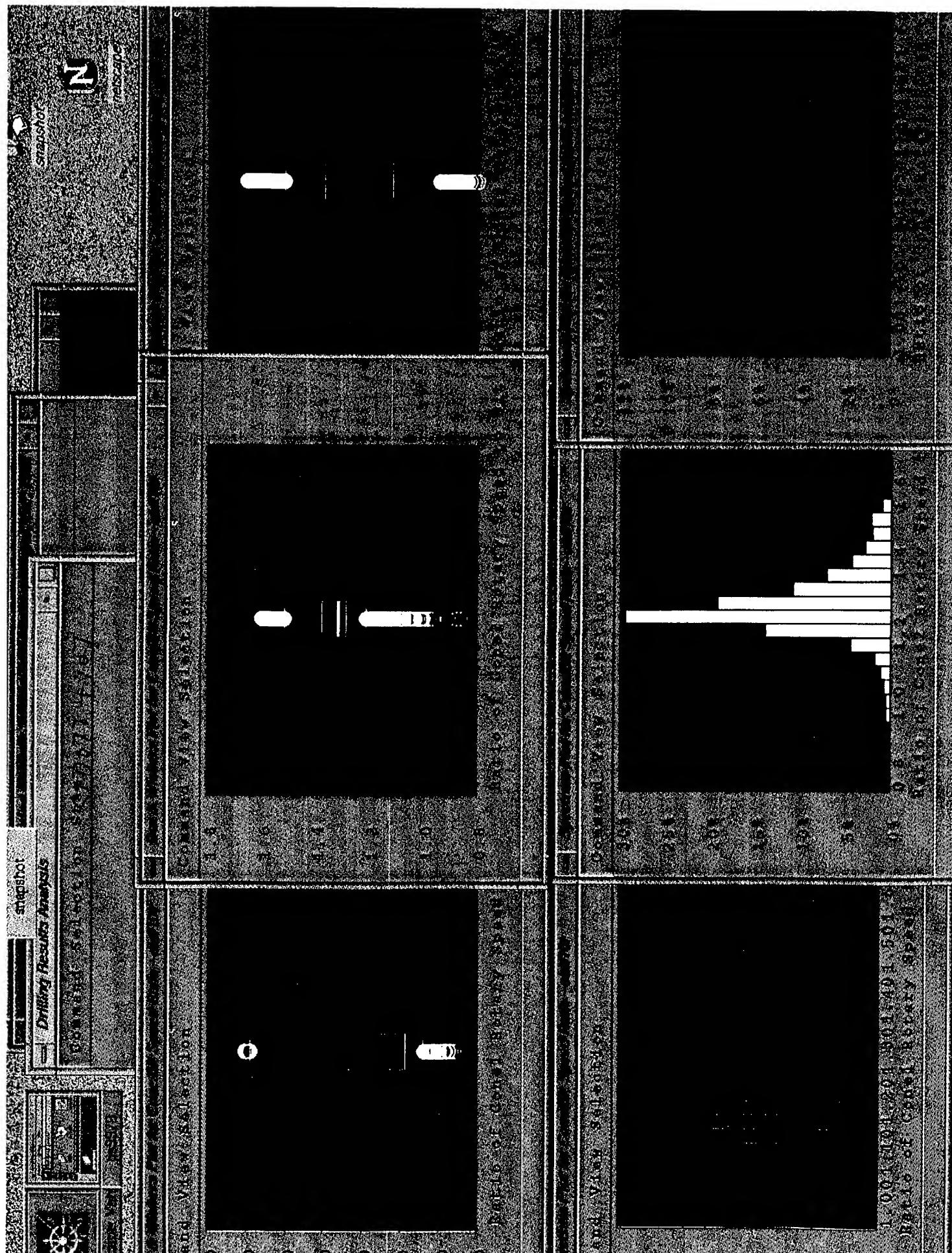


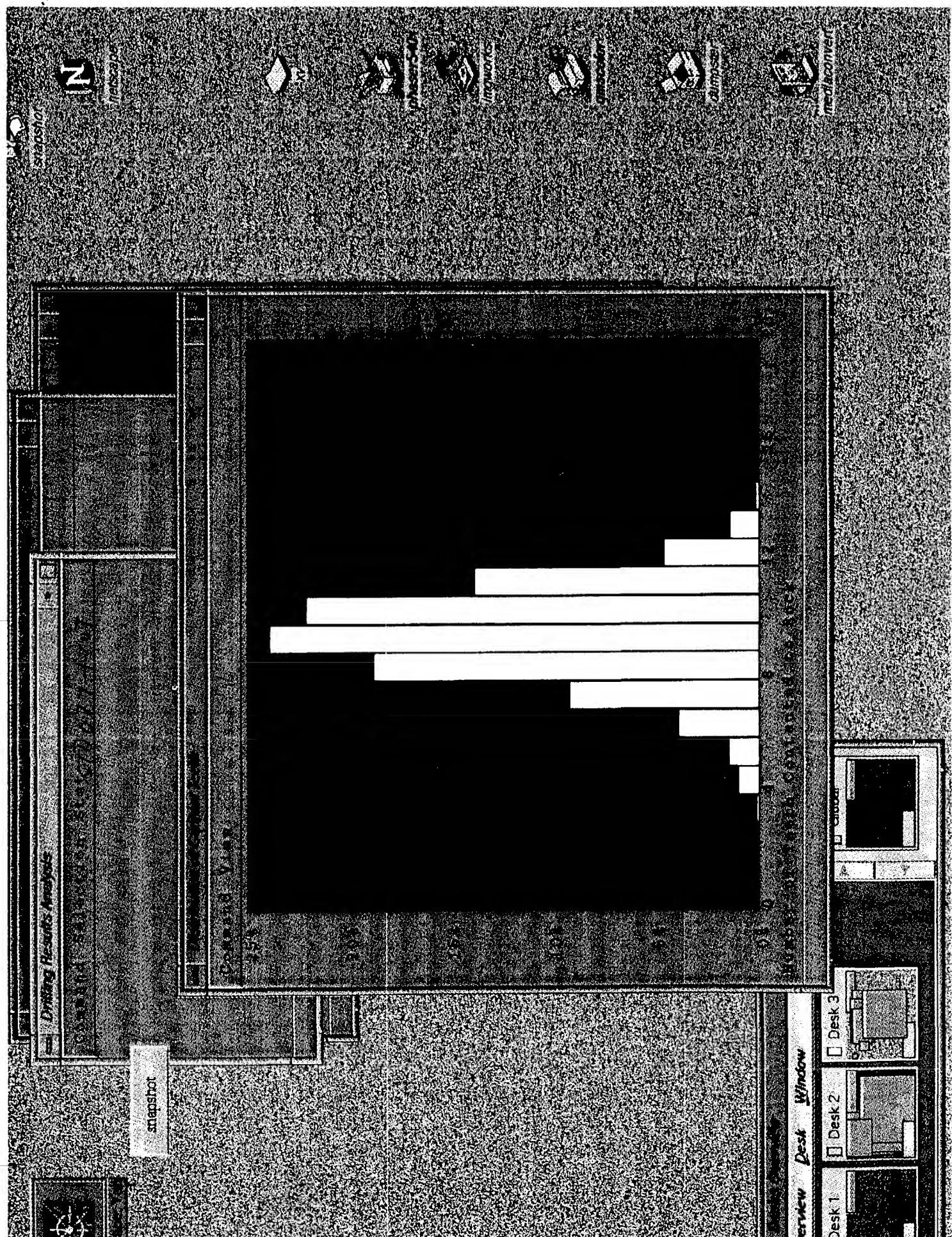


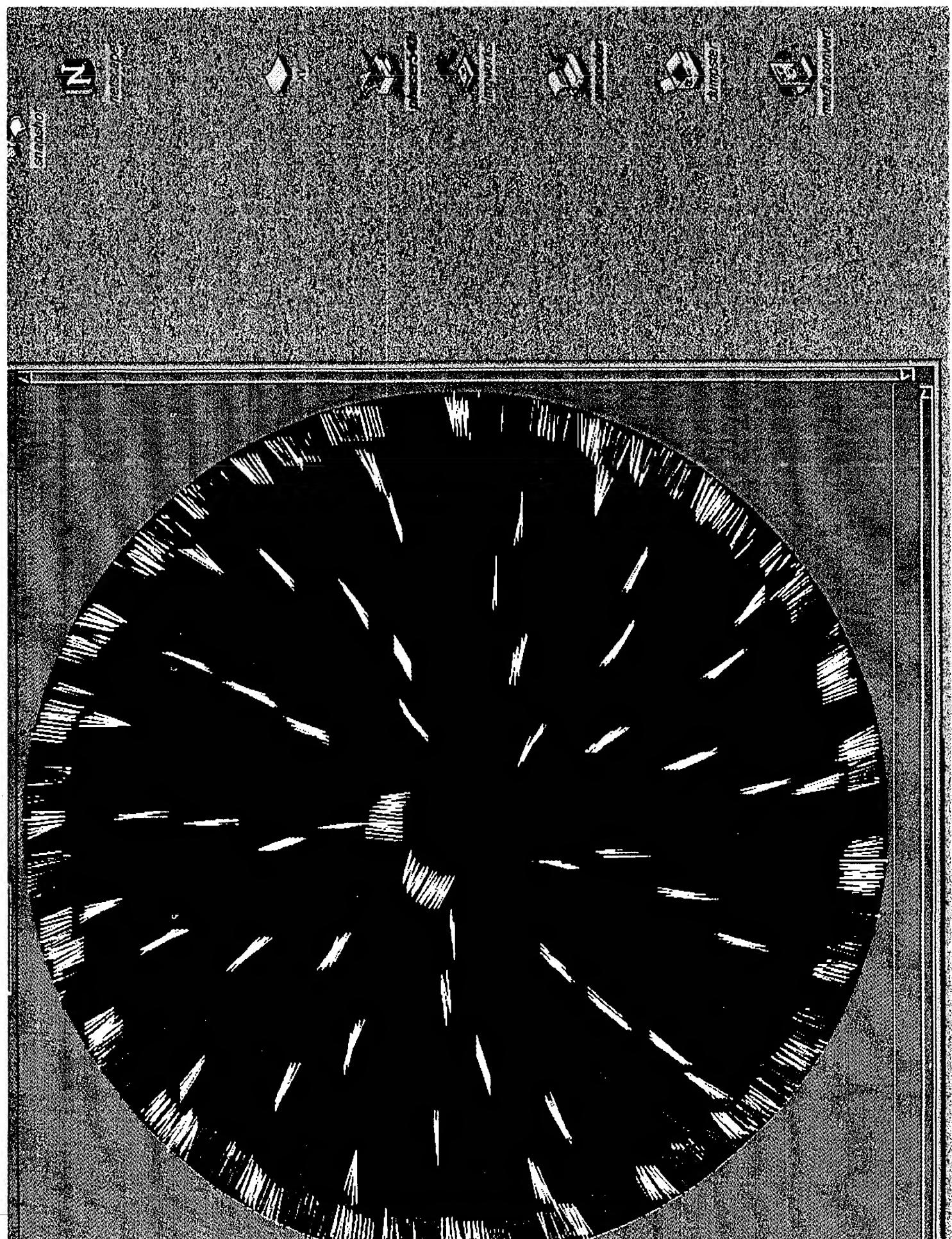


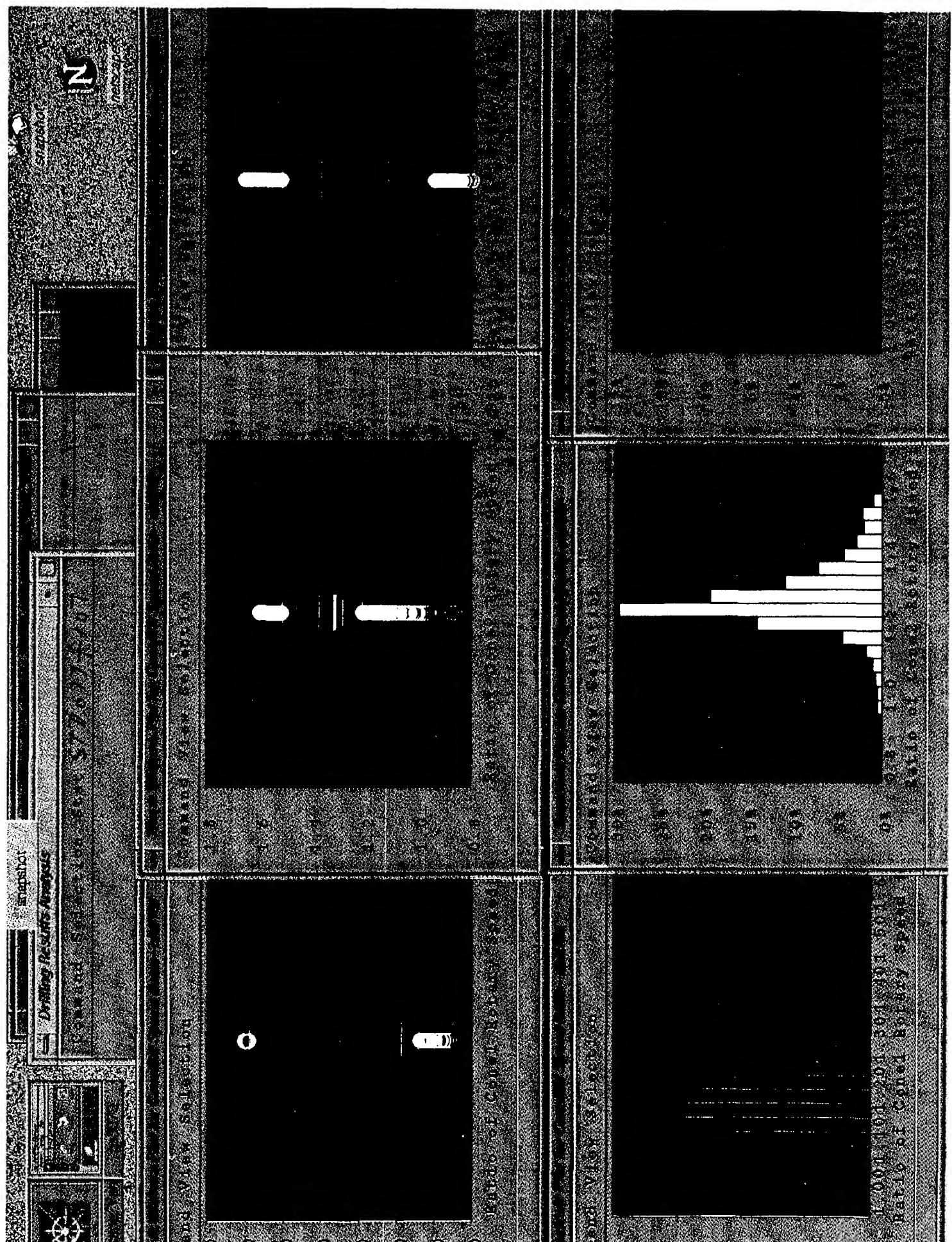


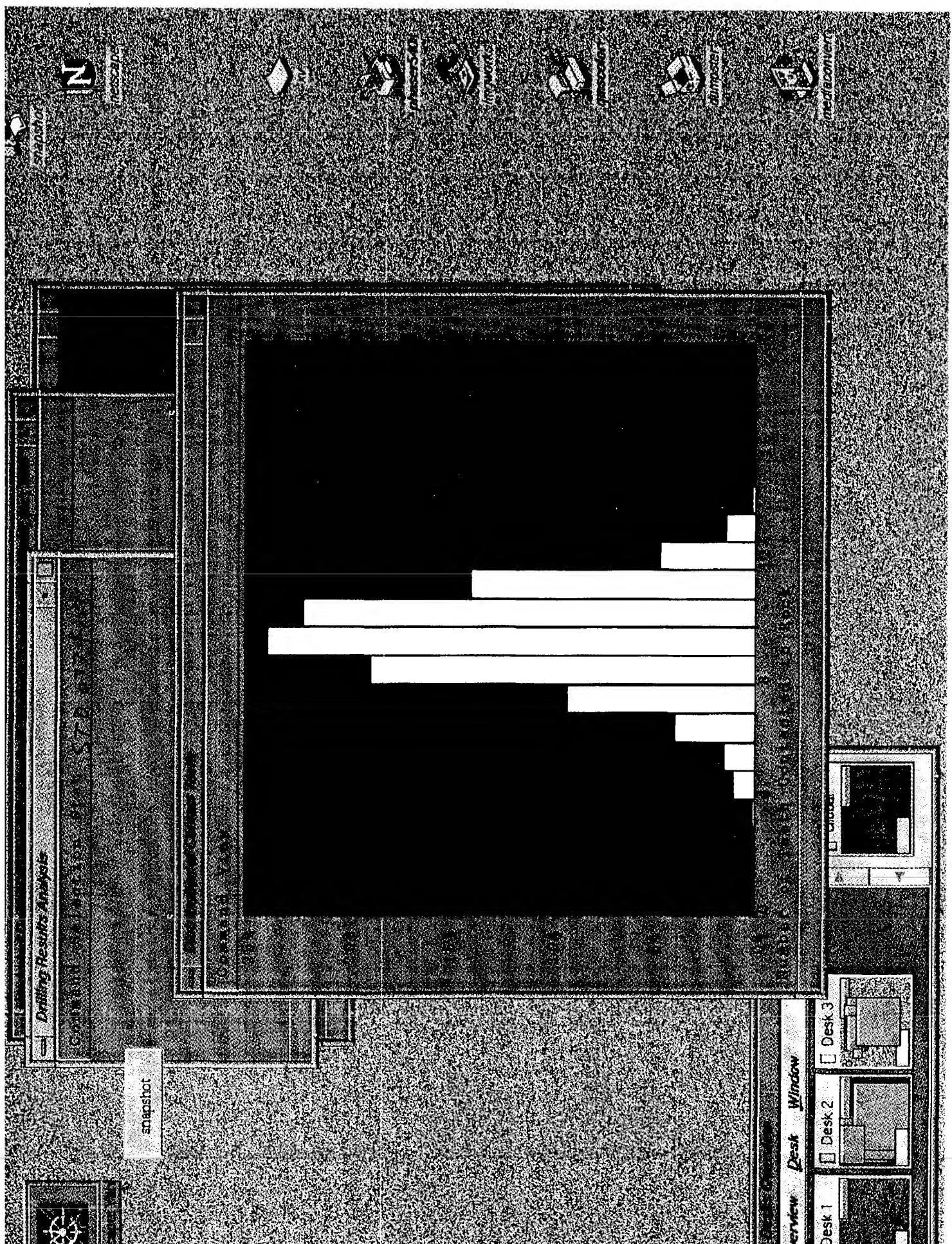












## IAS Calculation Summary

ject: /users/ps9978/projfl0t/offsetfl0t  
 meter of Bit: 7.87 (in) [200 (mm)]  
 ight on Bit: 42000 (lbf) [19051 (kgf)]  
 olutions per minute: 170 (rpm)  
 olutions of Simulated: 30 (rev)  
 fficient of Rock-shell contact: 1  
 hole area: 48.707 (sq.in)

offset

.375

## CutArea Coverage

(sq.in) %

21.29	43.70
16.90	34.69
17.62	36.17
18.42	37.82
18.69	38.38
19.16	39.34
18.78	38.55
20.28	41.63
19.38	39.78
19.55	40.15
19.25	39.52
19.68	40.41
17.85	36.66
19.17	39.36
19.07	39.16
18.16	37.29
18.46	37.91
19.47	39.97
17.41	35.74
19.70	40.44
20.02	41.10
18.61	38.20
17.42	35.77
18.70	38.39
17.05	35.00
19.61	40.25
19.62	40.28
19.37	39.77
19.82	40.68
19.88	40.81

range of Coverage for Bit: 38.90 %

range of Coverage for Each Row:

e	Row	Rmin (in)	Rmax (in)	C.Avr (sq.in)	CovI %	CovA %
1	3.852	3.937	0.002	0.07	0.00	
2	3.696	3.937	0.177	3.05	0.36	
3	3.162	3.937	1.950	11.28	4.00	
4	1.684	2.658	2.765	20.82	5.68	
5	0.232	0.896	0.186	7.91	0.38	
1	3.865	3.937	0.003	0.17	0.01	
2	3.716	3.937	0.150	2.83	0.31	
3	3.139	3.937	1.841	10.37	3.78	
4	2.299	3.277	3.582	20.91	7.35	
5	0.429	1.377	0.984	18.31	2.02	
1	3.865	3.937	0.002	0.09	0.00	
2	3.704	3.937	0.126	2.24	0.26	
3	3.154	3.936	2.060	11.83	4.23	
4	2.791	3.707	2.531	13.53	5.20	
5	1.122	1.996	2.060	24.07	4.23	

Penetration Depth 0.285 (ft) [87 (mm)]  
 Average ROP 85.48 (ft/h) [26.05 (m/h)]  
 Average Penetration Depth 0.253 (ft)  
 Average ROP 86.13 (ft/h)

e	Row	Fz_max	Fz_median	Fz_aver	Counts	Angle
		27.921	9.409	9.789		
1	1	0.043	0.001	0.002	22	0.00
2	2	0.507	0.015	0.036	11	0.00
3	3	13.478	1.738	2.335	11	0.00
4	4	24.115	6.980	7.451	9	0.00
5	5	7.583	0.790	1.235	1	0.00
		33.017	15.419	15.681		
1	1	0.102	0.001	0.003	22	0.00
2	2	0.606	0.015	0.035	10	0.00
3	3	12.631	2.089	2.755	10	0.00
4	4	31.227	9.346	10.067	11	0.00
5	5	13.728	3.925	4.008	4	0.00
		30.458	15.388	15.383		
1	1	0.071	0.001	0.003	22	0.00
2	2	0.542	0.011	0.030	9	0.00
3	3	13.085	2.813	3.330	9	0.00
4	4	17.166	5.811	5.826	9	0.00
5	5	22.570	6.945	7.075	7	0.00
6	6	1.179	0.294	0.355	1	0.00

e	Row	Insert Forces	Fx_aver	Fy_aver	Fz_aver
1	1		0.110	0.004	0.002
2	2		0.631	0.041	0.025
3	3		0.728	0.118	1.457
4	4		0.210	0.074	5.501
5	5		0.134	0.238	1.238
1	1		0.104	0.005	0.003
2	2		0.598	0.037	0.027
3	3		0.582	0.117	1.837
4	4		0.183	0.066	6.462
5	5		0.196	0.047	3.720
1	1		0.122	0.006	0.003
2	2		0.585	0.036	0.025
3	3		0.488	0.119	2.367
4	4		0.122	0.097	4.923
5	5		0.189	0.075	5.552
6	6		0.042	0.161	0.359

Ratio of Cone Rotary Speed to Bit:

e	Ratio
1	1.2201
2	1.3316
3	1.3274

apping	Brittle File Size	1476096 (bytes)
tical	Brittle File Size	13683936 (bytes)
ll	Contacted Times	2021 (times)
tact	Percentage of Shell to Rock	56.1389 %

IS Calculation Summary

ject: ././offsetf10t

meter of Bit: 7.87 (in) [200 (mm)]

ght on Bit: 42000 (lbf) [19051 (kgf)]

olutions per minute: 85 (rpm)

olutions of Simulated: 30 (rev)

fficient of Rock-shell contact: 1

hole area: 48.707 (sq.in)

CutArea Coverage

(sq.in) %

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16.90 34.69

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4	2.791	3.707	2.531	13.53	5.20
5	1.122	1.996	2.060	24.07	4.23
6	0.343	0.658	0.039	3.92	0.08

Penetration Depth 0.285 (ft) [87 (mm)]  
 Average ROP 42.74 (ft/h) [13.03 (m/h)]  
 Average Penetration Depth 0.253 (ft)  
 Average ROP 43.07 (ft/h)

#	Row	Fz_max	Fz_median	Fz_aver	Counts	Angle
		27.921	9.409	9.789		
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5	5	22.570	6.945	7.075	7	0.00
6	6	1.179	0.294	0.355	1	0.00

#	Row	Insert Forces	Fx_aver	Fy_aver	Fz_aver
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#	Ratio
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2	1.3316
3	1.3274

Appling Brittle File Size	1476096 (bytes)
Actual Brittle File Size	13683936 (bytes)
All Contacted Times	2021 (times)
Contact Percentage of Shell to Rock	56.1389 %



snapshot

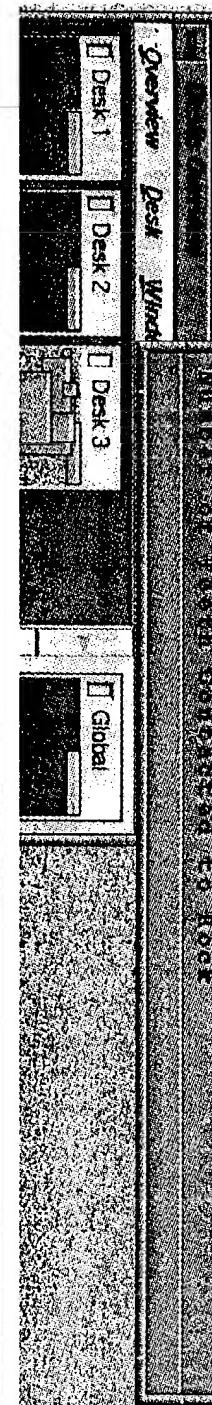
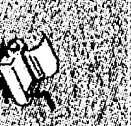
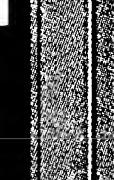
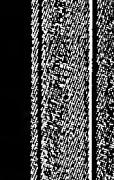
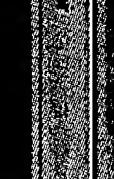
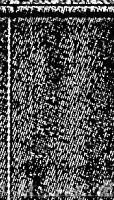
Desktop Selected Internet Find System CAD Handcopy Staff Help

PS978



snapshot

245879  
07/07/97  
netscape



Control Panel Services Logon

snapshot

077 First Find

Find

System

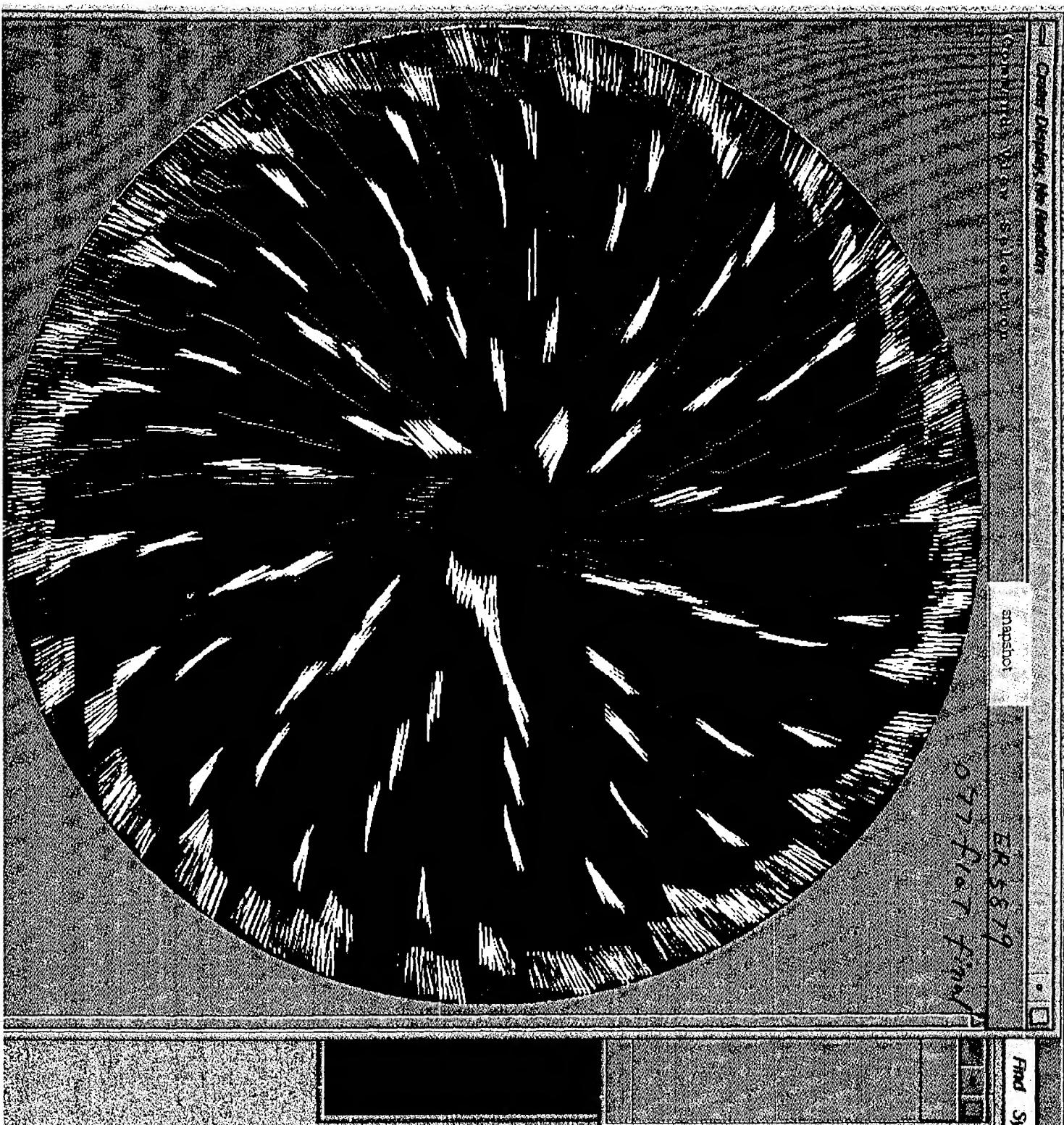
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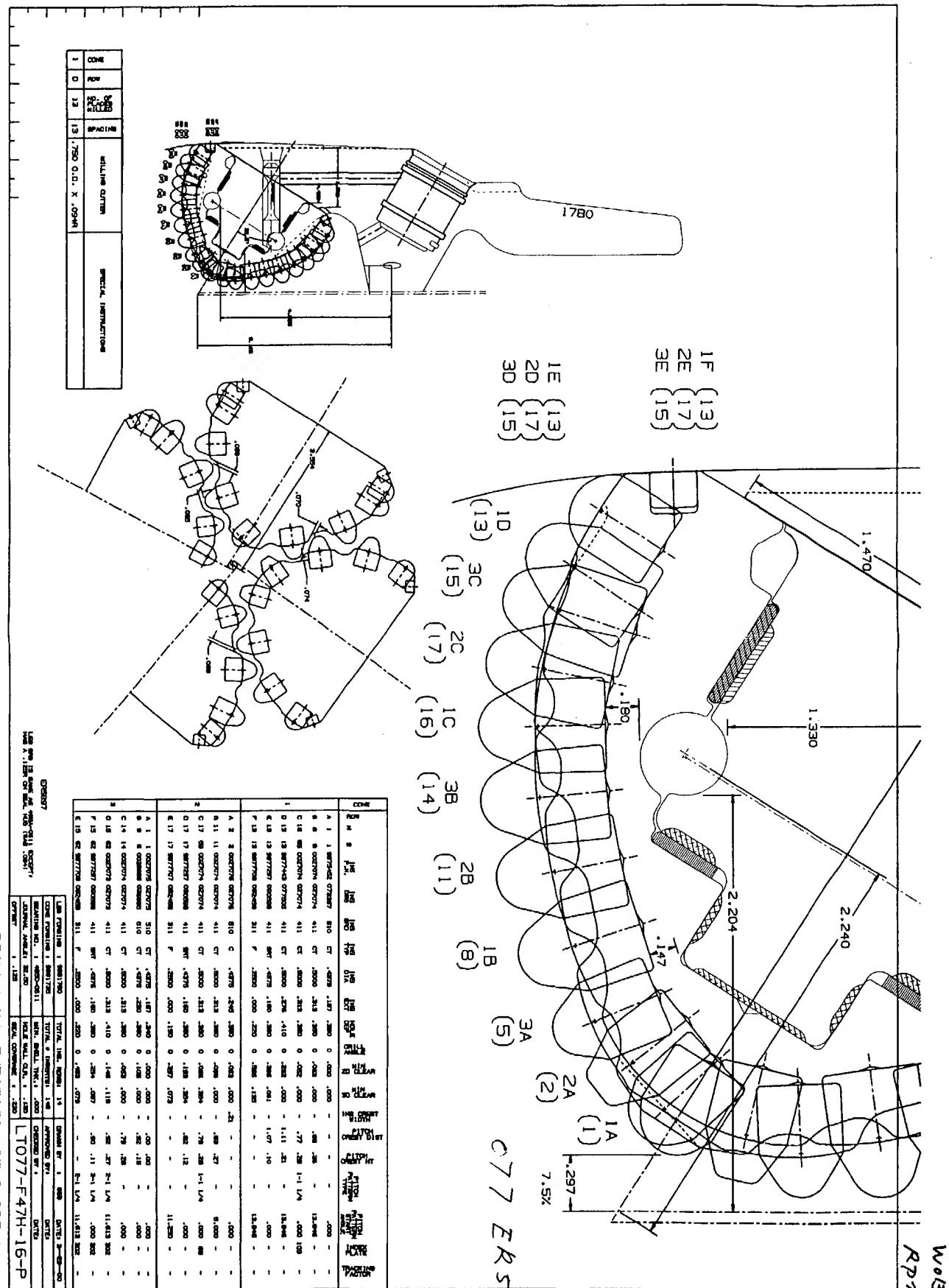
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Stuff

Help

05/97/8





DRILL/MILL ENTITIES ARE CURRENT

Calculation

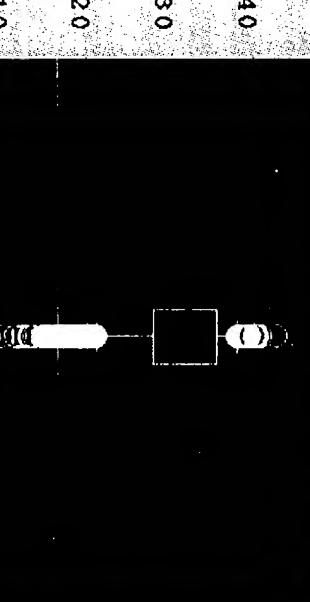
Simulation

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0.774674 m/s

netscape

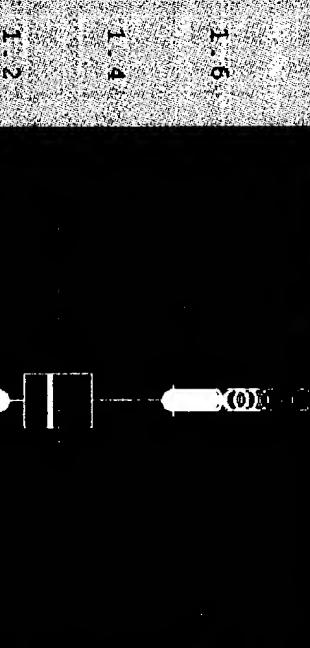
Command View Selection

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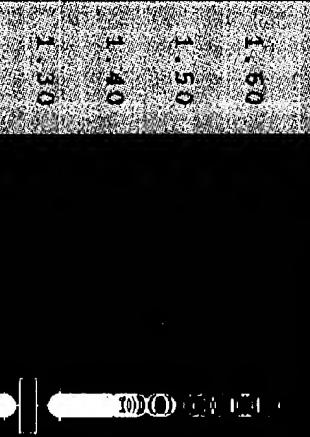
Command View Selection

1.8



Command View Selection

1.70



50

Command View Selection

0.0

Ratio of Cone1 Rotary Speed

Ratio of Cone2 Rotary Speed

Ratio of Cone3 Rotary Speed

Command View Selection

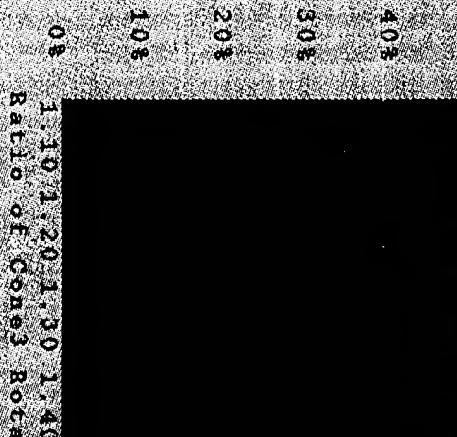
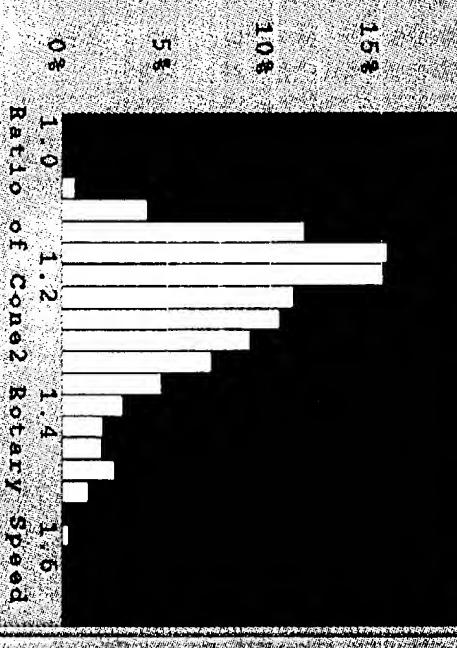
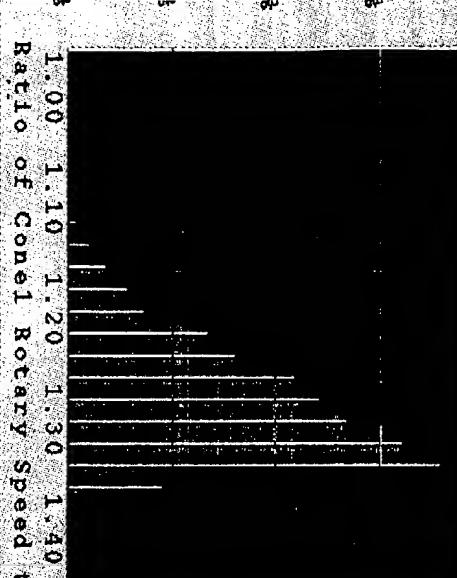
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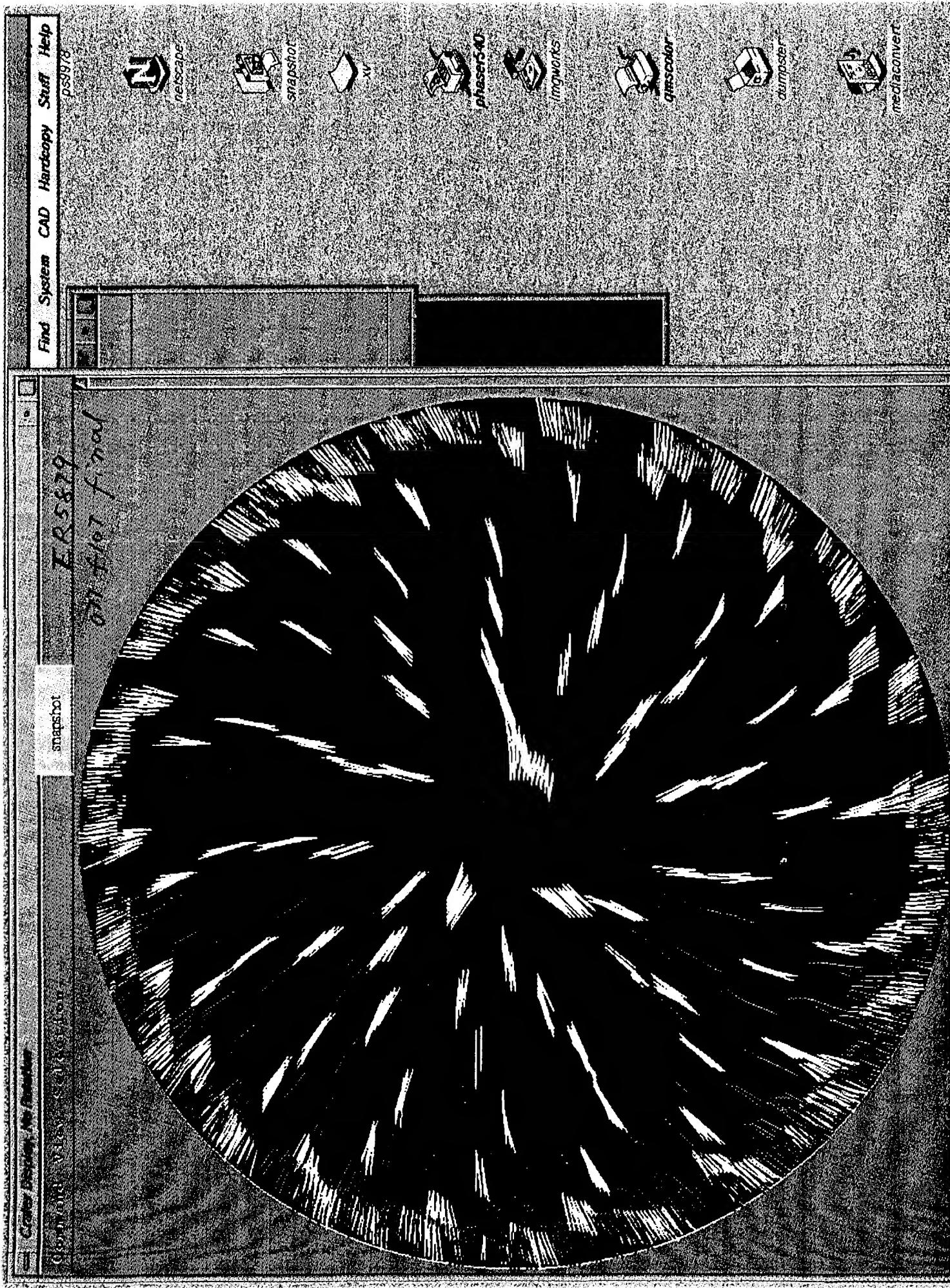
Command View Selection

Ratio of Cone1 Rotary Speed

Ratio of Cone2 Rotary Speed

Ratio of Cone3 Rotary Speed





# Peer Review

**Project Information:****Page: 1**

Title: 077f10t

Number: cs-p-15

Leader(s): YING XIANG

**Meeting Schedule:**

Date: Feb. 10, 2000

Time: 9.00 a.m.

Place: room 2002

**Meeting Objectives:**

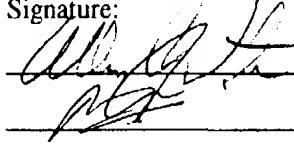
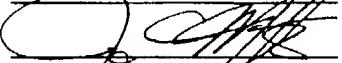
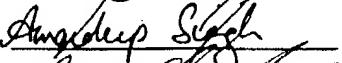
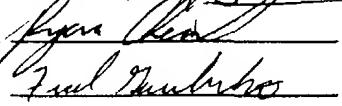
- 077 F10t cutting structure design review

•  
•  
•

**Agenda Topics****Time Allotment**

► Review Product Brief	<input checked="" type="checkbox"/> PDP	<input type="checkbox"/> ECR	<input type="checkbox"/> CAR	<input type="checkbox"/> EPA	⌚ 10
► information from the field					⌚ 10 min
► Review new design					⌚ 45 min
► open discuss					⌚ 15 min
►					⌚
►					⌚
► Recap Meeting and Action Items					⌚ 5 min

**Invitees:** (Attendance indicated by signature)

Name:	Signature:	Name:	Signature:
SCOTT McDONOUGH Kari Rose		ALLEGRA WATSON Prabhakar Certala	
JIM MINIKUS			
AMAR SINGH			
LYNN CHEVRETT Ted Gurbrecht			

**Design Review Result:**

<input type="checkbox"/> Unconditional Approval (No change required)	<input type="checkbox"/> Conditional Approval (Action items must be completed)	<input type="checkbox"/> Another Design Review Required (Redesign and conduct another design review)
---	---	---

**Verification:**

Manager/Supervisor Signature: \_\_\_\_\_ Date: \_\_\_\_\_

# Peer Review

**Project Information:****Page: 2**

Title: 077F10t

Number: CS-P-15

Date: Feb. 10, 2000

**Action Items:**

short the existing bearing sleeve. put bullet seal.  
mud bug system on the hit.

Action Taken:

name it fw in system

ER number for field.

Action Taken:

**Action Items Addressed:**

Project Leader's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

# SMITH TOOL

## ENGINEERING ORDER

No.: 24017

Sheet 1 of 1  
Location: PONCA

PROJECT/ECR NO.: CS-P-15	E.R. NO.: 5897
SIZE/TYPE: 077 F10T	BEARING NO.: 525-0540
TITLE: IDEALS BIT DESIGN	

DESCRIPTION:

CREATED A NEW BOM FOR 077 F10T TYPE BIT

BIT FEATURES:

- 1.) THIS NEW BIT CUTTING STRUCTURE IS DESIGNED TO GAIN HIGHER ROP - BETTER DULL CONDITION BY USING IDEALS SA CUTTING STRUCTURE ANALYSE TOOL.
- 2.) NO TRUE CUT FEATURE - ROW COUNT, INSERT COUNT ARE OPTIMIZED TO ACHIEVE HIGHER ROP.
- 3.) TWO NEW INNER ROW INSERTS - THREE DIFFERENT GAGE ROW INSERTS WITH DIFFERENT DIA. - DIFFERENT LOCATIONS ALONG GAGE CURVE.
- 4.) THIS BIT ALSO FEATURES A NEW BRG WITH BULLET SEAL SIMILAR TO BRG 525-0580.

ISSUED

MAR 08 2000

ENGRG. HOUSTON

PART #	REV.	DRAWING #	REV.	PART # SUPERCEDED	DRAWING # SUPERCEDED	DESCRIPTION
0026557						BOM FOR 077 F10T TYPE BIT NEW
0026848		205380				CONE 1 077 F10T ASSY NEW
0026849		205381				CONE 2 077 F10T ASSY NEW
0026850		205382				CONE 3 077 F10T ASSY NEW
		205376				CONE 1 077 F10T PROF. & DRILL NEW
		205377				CONE 2 077 F10T PROF. & DRILL NEW
		205378				CONE 3 077 F10T PROF. & DRILL NEW
		205388				CONE BRG DETL. NEW
0026854		205383				LEG MACH DETL. NEW
		205384				JRNL MACH DETL. NEW
		205385				JRNL FINISH DETL. NEW
		205386				LEG REMILL DETL. NEW
		205389				SHALE BURN INSERT DETL. NEW
0026855		D0026855				AG PLT. SPINODL BRG SLV NEW
0026445		D0026445				TCI SRCVSB 1/2 DIA./.380GP/.320EXT. NEW
0026289		D0026389				TCI SRCVSB 9/16 DIA./.410GP/.430EXT. NEW

REASON: PRODUCT MANAGER'S REQUEST

POSITION OF AFFECTED PARTS: N/A

Prepared By: LEONARD WRIGHT	Approved By: GARY GARCIA	Date: 08 MAR 00	Configuration Mgmt.: S Schindler	Date: 3-8-00
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\*\*\* PONCA CITY \*\*\*  
Indented Bill of Material Report

Date: 08-MAR-00  
Page: 1

Item: 0026557 Size: 077 Type: F10T Features:  
ER: 5879 IADC: 437X Pin Size: 4 1/2 BRG #: 525 - -0540  
Rev: -- EO: 24017 Status: E Rev Date: 06-MAR-00

Item Description: 077 F10T ER5879 2312 FPD/AG BRG/SF IADC 437X

LEVEL	COMPONENT	REV	DESCRIPTION	QUANTITY	UOM
1	0026848	--	1 CONE 077 F10T ASSEMBLY	1.000	EA
2	D205380	--	DWG 1 CONE 077 F10T ASSEMBLY		
2	D205376	--	DWG 1 CONE 077 F10T PROF & DRILL		
2	0009874	D	SRTC TCI 1/2 FB .203 EXT/.470 GP/GR 411H	1.000	EA
3	D0009874	--	DWG SRTC TCI 1/2 FB.203 EXT		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6 (S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	0026445	--	SCRVB TCI 1/2 FB .320 EXT/.380 GP/GR 614	9.000	EA
3	D0026445	--	DWG SCRVB TCI 1/2 FB .320 EXT		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6 (S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	0026289	--	SCRVB TCI 9/16 FB.430 EXT/.410 GP/GR 614H	14.000	EA
3	D0026289	--	DWG SCRVB TCI 9/16 FB .430 EXT		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6 (S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	0022626	--	RGCSS TCI 13/32FB .230 EXT .310 GP/GR 510H	18.000	EA
3	D0022626	--	DWG RGCSS TCI 13/32 FB .230 EXT		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6 (S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	9977707	A	F TCI 1/4 FB .000 EXT/.190 GP/GR 311	18.000	EA
3	D9977707	--	DWG F TCI 1/4 FB.000 EXT		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6 (S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	D093412	-	CONE CARB DTL		
2	D205388	--	CONE BRG DTL		
1	0026849	--	2 CONE 077 F10T ASSEMBLY	1.000	EA
2	D205381	--	DWG 2 CONE 077 F10T ASSEMBLY		
2	D205377	--	DWG 2 CONE 077 F10T PROF & DRILL		
2	0000231	-	C TCI 7/16 FB .204 EXT/.410 GP/GR 510H	2.000	EA
3	D092765	-	MAIN ENGR DRAW		
2	0026289	--	SCRVB TCI 9/16 FB.430 EXT/.410 GP/GR 614H	25.000	EA
3	D0026289	--	DWG SCRVB TCI 9/16 FB .430 EXT		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6 (S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	0018265	--	RGCSS TCI 3/8 FB .200 EXT .310 GP/GR411	15.000	EA
3	D0018265	--	DWG RGC TCI 3/8 FB .200 EXT.		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6 (S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	9977707	A	F TCI 1/4 FB .000 EXT/.190 GP/GR 311	15.000	EA
3	D9977707	--	DWG F TCI 1/4 FB.000 EXT		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6 (S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	D093412	-	CONE CARB DTL		
2	D205388	--	CONE BRG DTL		
1	0026850	--	3 CONE 077 F10T ASSEMBLY	1.000	EA
2	D205382	--	DWG 3 CONE 077 F10T ASSEMBLY		
2	D205378	--	DWG 3 CONE 077 F10T PROF & DRILL		
2	9977315	C	SRTC TCI 7/16 FB .190 EXT/.360 GP/GR 411H	1.000	EA
3	D9977315	--	DWG SRTC TCI 7/16 FB.190 EXT		

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Date: 08-MAR-00  
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Item: 0026557 Size: 077 Type: F10T Features:  
ER: 5879 IADC: 437X Pin Size: 4 1/2 BRG #: 525 - -0540  
Rev: -- EO: 24017 Status: E Rev Date: 06-MAR-00

Item Description: 077 F10T ER5879 2312 FPD/AG BRG/SF IADC 437X

LEVEL	COMPONENT	REV	DESCRIPTION	QUANTITY	UOM
3	3-17315	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6(S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	0026445	--	SCRVB TCI 1/2 FB .320 EXT/.380 GP/GR 614	5.000	EA
3	D0026445	--	DWG SCRVB TCI 1/2 FB .320 EXT		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6(S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	0026289	--	SCRVB TCI 9/16 FB .430 EXT/.410 GP/GR 614H	13.000	EA
3	D0026289	--	DWG SCRVB TCI 9/16 FB .430 EXT		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6(S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	0023857	--	RGCSS TCI 7/16FB .250 EXT .310 GP/GR 510H	18.000	EA
3	D0023857	--	DWG RGCSS TCI 7/16 FB .250 EXT		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6(S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	9977707	A	F TCI 1/4 FB .000 EXT/.190 GP/GR 311	18.000	EA
3	D9977707	--	DWG F TCI 1/4 FB.000 EXT		
3	3-1	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
3	50-6(S)	-	SPEC TUNGSTEN CARBIDE INSERTS		EA
2	D093412	-	CONE CARB DTL		
2	D205388	--	CONE BRG DTL		
	0026854	--	LEG 077 OSVB/32.5 JRNL/.312 OFFSET/2.360-C	3.000	EA
2	D205383	--	DWG LEG 077 F10T DOMEVENT W/SHALE GROOVE		
2	9991780	A	LEG FORG/OSVB 073-077 FTCI/FMT (4815)	3.000	EA
3	D087651	D	LEG FORG/OSVB		
3	D087656	B	LEG FORGE INSP		
2	9860104	-	HC-1 HARDMETAL	0.309	LB
2	9860427	-	HARDMETAL ROD ST-70M	0.027	LB
2	9976500	B	F TCI 7/16 OD 9/32GP/GR 311/.015 CHAMF	3.000	EA
3	D081257	B	DWG F TCI 7/16 OD		
2	0024824	--	1/4 FLAT SHALE BURN PLUG	3.000	EA
3	D0024824	--	DWG. 1/4 FLAT SHALE BURN PLUG		
2	D099548	B	LEG PAINT OFF		
2	D098790	F	RSVR DETAIL		
2	D089087	A	JET CIRC DETAIL		
2	D203413	--	LEG MILLING DTL		
2	D205385	--	JRNL FINISH DTL		
2	D205384	--	JRNL MACH DTL		
2	D205386	--	LEG REMILL DTL		
2	D205389	--	SHALE BURN INSERT ASSY		
	9977347	B	BHP 7/16 DIA 2.17 LG - .110 LIP	3.000	EA
2	D090795	L	DWG BHP		
	9970531	B	7/16 DIA BALL	42.000	EA
2	D0024795	B	DWG BALL BEARING		
2	50-6(B)	-	SPEC - 50-6(B)		EA
	0026855	--	AG PLT/SPIN.BRG.SLV 1.9935ID X.070 X .540	3.000	EA
2	D0026855	--	DWG SILVER SPINODL BRG SLV (PRO-E )		
	0018415	A	BULLET SEAL 077-084	3.000	EA
2	D200502	A	DWG BULLET SEAL		
	0021740	A	077 - 097 DOMEVENT II RSVR ASSY	3.000	EA

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Date: 08-MAR-00  
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Item: 0026557 Size: 077 Type: F10T Features:  
ER: 5879 IADC: 437X Pin Size: 4 1/2 BRG #: 525 - -0540  
Rev: -- EO: 24017 Status: E Rev Date: 06-MAR-00

Item Description: 077 F10T ER5879 2312 FPD/AG BRG/SF IADC 437X

LEVEL	COMPONENT	REV	DESCRIPTION	QUANTITY	UOM
2	D0021740	A	DWG 077-097 DOMEVENT II RSVR ASSY (PRO-E)		
2	0021735	A	077-097 CANNISTER: DMVT II	3.000	EA
3	D0021735	A	DWG 077-097 CANNISTER: DMVT II (PRO-E)		
2	0021710	--	077-097 DMVT II RSVR BOOT ASSEMBLY	3.000	EA
3	D0021710	--	DWG 077-097 DMVTII RSVR BOOT ASSY W/9RIBS		
3	0021909	--	077-097 BOOT RUBBER: (PRO-E)		EA
3	0021711	--	077-097 DMVT II BOOT REINFORCING SLEEVE		EA
4	D0021711	--	DWG 077-097 DMVT II BOOT R.F. SLV (PRO-E)		
3	0021712	B	077-097 DMVT II BOOT DISC		EA
4	D0021712	B	DWG 077-097 DMVT II STEEL BOOT DISC (PRO-E)		
4	50-6(N)	-	SPEC - 50-6(N)		EA
2	0021736	--	077-097 RSVR END CAP: DMVT II	3.000	EA
3	D0021736	--	DWG 077-097 RSVR END CAP: DMVT II (PRO-E)		
2	0021713	A	077-097 BELLEVILLE SPRING: DMVT II	3.000	EA
3	D0021713	A	DWG 077-097 (STAINLESS) B-SPRING: (PRO-E)		
3	50-6(L)	-	SPEC - 50-6(L)		EA
2	0021737	--	077-097 DMVT II RETAINING RING	3.000	EA
3	D0021737	--	DWG 077-097 RETAINING RING (PRO-E)		
2	0017620	A	PIPE PLUGS (FLUSH TOP) 1/8-27 - 7/8 TAPER	3.000	EA
3	D200049	A	DWG PIPE PLUG (FLUSH TOP) (PRO-E)		
2	0016327	-	077-097 CANNISTER O-RINGS MAT'L NBR-R	6.000	EA
3	D093799	A	DWG O-RING STATIC		
	9970669	C	O-RING STATIC AS 568-218 / 95 SERIES	3.000	EA
2	D093799	A	DWG O-RING STATIC		
	9930677	A	BOX ASSY (C) 7 5/8 - 7 7/8 3-CONE BITS	1.000	EA
2	9930659	A	BIT BOX C,CC 075 - 077 ALL TYPES	1.000	EA
3	D090378	L	DWG BIT BOX PRINTING & INSIDE DIMENSIONS		
2	9930660	-	BOX LINER (CC) 7 5/8 - 7 7/8 ALL TYPES	1.000	EA
3	D090379	H	DWG BIT BOX LINER		
2	0004897	-	BOX STABLZR (C) 7 5/8 - 7 7/8 ALL TYPES	1.000	EA
3	D095287	E	DWG BIT BOX STABILIZER		
2	9930043	-	BOX TOP (C) 7 5/8 - 7 7/8	1.000	EA
3	D090380	J	DWG BIT BOX TOPS & BOTTOMS		
2	9930044	-	BOX BOTTOM (C) 7 5/8 - 7 7/8 (PLYWOOD)	1.000	EA
3	D090380	J	DWG BIT BOX TOPS & BOTTOMS		
2	9930663	A	BOX BOTTOM (C) 7 5/8 - 7 7/8 (FIBRBOARD)	1.000	EA
3	D090380	J	DWG BIT BOX TOPS & BOTTOMS		
2	0018573	--	BIT BOX LABEL (LARGE)	1.000	EA
3	D200136	A	DWG BIT BOX LABEL (LARGE)		
3	0017781	-	BIT BOX LABEL (LARGE)	1.000	EA
3	0017782	-	BIT BOX LABEL (LARGE)	1.000	EA
	9860483	-	BIT GREASE STL-057	1.000	LB
2	9860484	-	GREASE-BRG & O-RING-TEXCLAD #2	0.500	LB
2	9860485	-	PIN PROT COATG-TEXACO COMPND "L" RUST PREV	0.125	LB
2	9860486	-	WELD FILLER-SEAMS & CROWN-AWS E70S-6	1.000	LB
2	9860487	-	WELD FILLER-BALL HOLE PLUG-AWS E70S-6	0.125	LB
	0000091	-	VEE SHIM/OSVB 073 - 077 BITS	1.000	EA
2	D039769	B	DWG VEE SHIM/OSVB		
	0000092	-	SIDE SHIM/OSVB 073 - 097 BITS	3.000	EA

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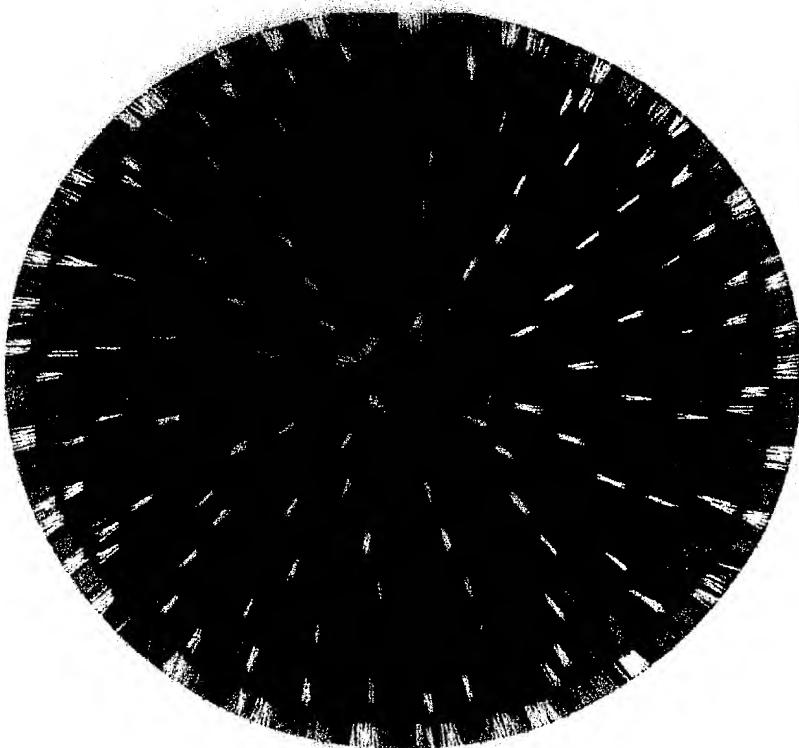
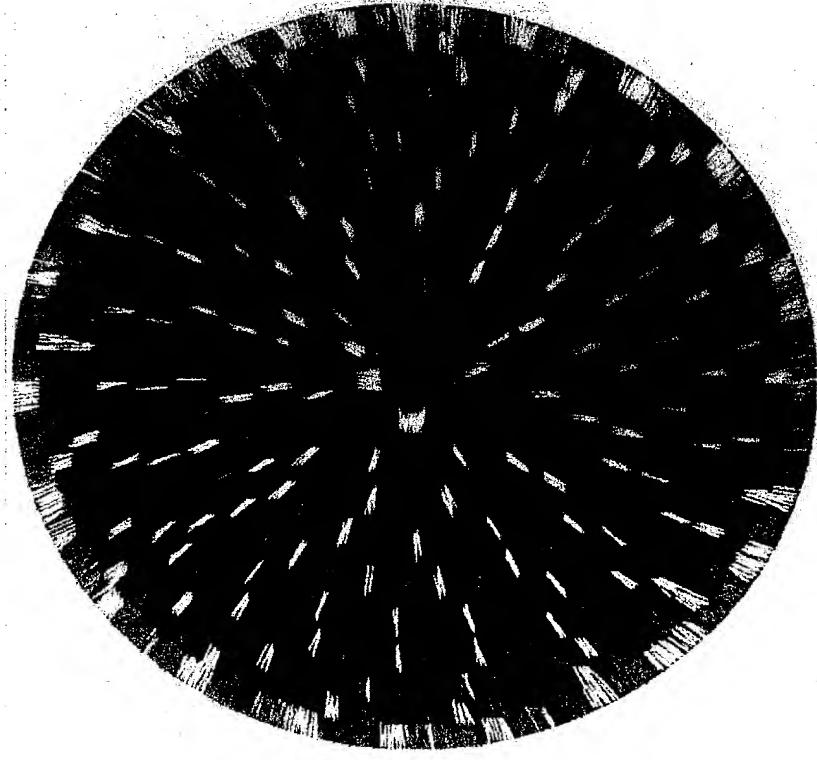
Item: 0026557 Size: 077 Type: F10T Features:  
ER: 5879 IADC: 437X Pin Size: 4 1/2 BRG #: 525 - -0540  
Rev: -- EO: 24017 Status: E Rev Date: 06-MAR-00

Item Description: 077 F10T ER5879 2312 FPD/AG BRG/SF IADC 437X

LEVEL	COMPONENT	REV	DESCRIPTION	QUANTITY	UOM
2	D044887	B	DWG SIDE SHIM/OSVB		
	9974315	A	DOME SHIM/OSVB 7 5/8 - 7 7/8 BITS	1.000	EA
2	D046369	A	DWG DOME SHIM/OSVB		
	0009960	-	BIT BOX LABEL #2 - "SCULPTURED" INSERTS	1.000	EA
2	D095644	-	DWG BOX LABEL #2 - "SCULPTURED" INSERTS		
	0014200	E	THRUST WASHER 1.059ID X 1.820ODX .070 SLV	3.000	EA
2	D098470	E	DWG THRUST WASHER (SILVER PLATED)		
	9860482	-	BIT PAINT-METALLIC GREEN LACQUER	0.250	LB
	D095459	A	SEAL SEL CHART		
	D205379	--	DWG LAYOUT LT077-F10T-04		

\*\*\* End of Report - INDENTED Bill of Material Report \*\*\*

IDEASTM Bit Design: 7 7/8 ER5897 (E47H)



STD 077 E47H

077 ER5897

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STD 077 F47H



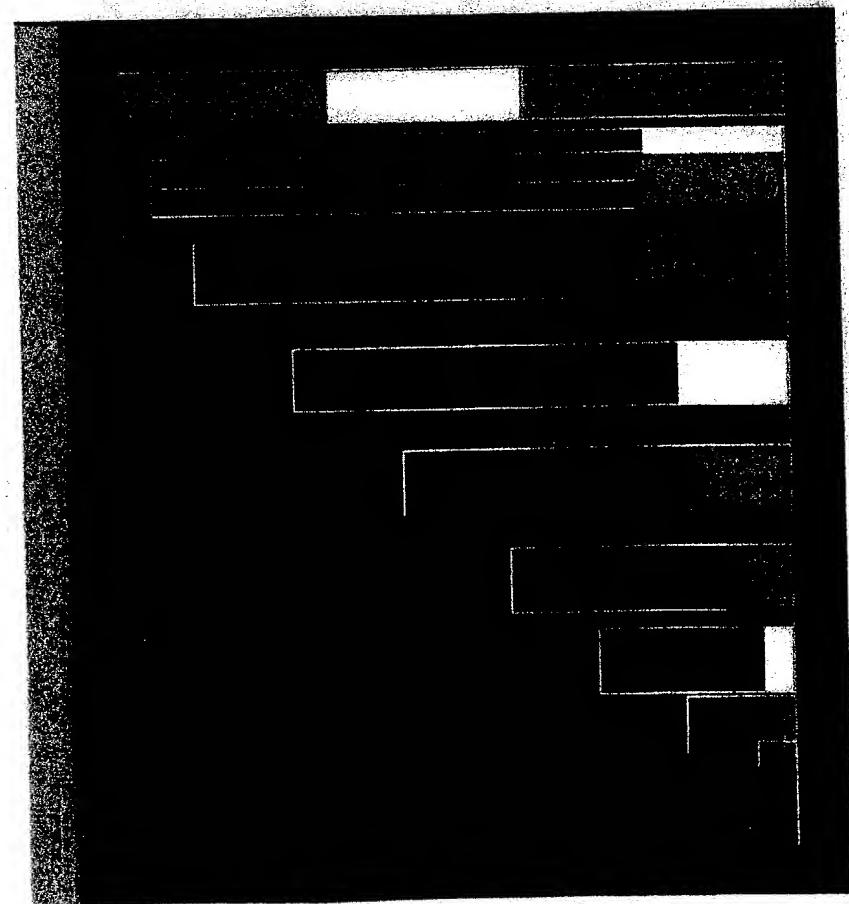
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IDEASTM Bit Design: 7 7/8 ER 5897 (F47H)

STD 077 F47H

077 ER5897



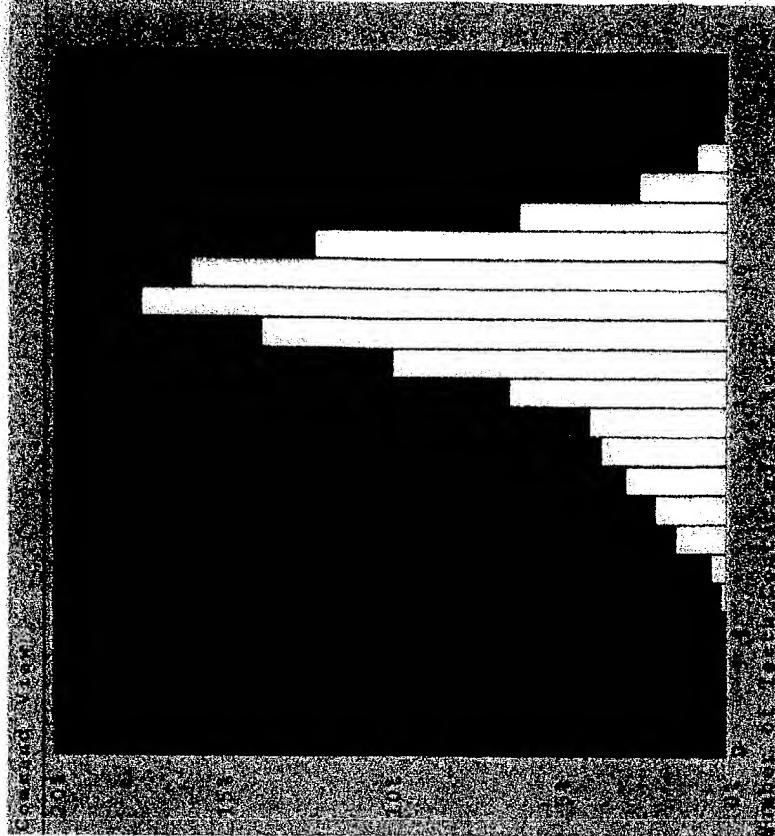
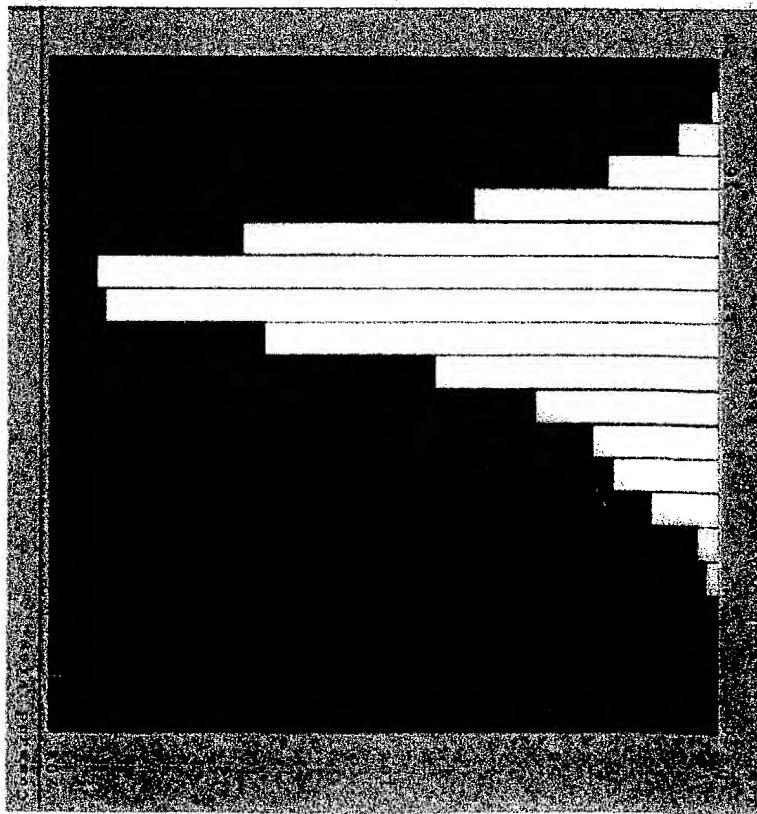
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IDEASTM Bit Design: 77/8 ER5897 (F47H)

STD 077 F47H

077ER5897



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